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FEDERAL-GRANT RESEARCH
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U. S. DEPARTMENT OF AGRICULTURE

Projects on
AGRICULTURAL ENGINEERING
Part 3, Section a
Land and Water Use and Development

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Compiled March 1958, by

the State Experiment Stations Division, Agricultural Research Service, U.S. Department of Agriculture, Washington 25, D. C., for use of workers in agricultural research in the subject-matter areas presented. For information on specific research projects write to the Director of the Station where the research is being conducted.

Issued May 1958

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STATE AGRICULTURAL EXPERIMENT STATIONS

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Section a: Land and Water Use and Development

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INTRODUCTION

This compilation is one of a series providing information on State agricultural experiment station research supported by Federal-grant funds appropriated annually by Congress under authorization of the Hatch Act of 1887, as amended and approved Aug. 11, 1955, and Section 204(b) of the Agricultural Marketing Act of 1946. It is prepared for use by research workers in the subject-matter areas presented. Only that part of each State's research program supported by Federal-grant moneys is included.

In addition to the Federal-grant moneys, the State experiment stations receive some Federal support through cooperative agreements or contracts with the U.S. Department of Agriculture. Information on such research, along with other departmental research, is available in the Central Project Office, Agricultural Research Service.

A substantial part of each State agricultural experiment station's research is supported with moneys appropriated by the respective State or Territorial Legislatures and through other forms of private and public financing. Information on current agricultural research at the stations which is not financed under the Federal-grant program or through USDA cooperation can be obtained from experiment station directors.

The information given in the series of Federal-grant compilations includes the title and objectives of each Federal-grant project pertaining to the subject given on the cover. The identification of each project gives the department(s) conducting the research, the station number of the project, and the number of the regional project, if it is a contributing project.

Relevant regional projects appear at the end of the compilation. States having projects contributing to regional projects are indicated. The States are grouped into four major regions. These are designated NC-North Central, NE-Northeastern, S-Southern, and W-Western.

FEDERAL-GRANT PROJECTS BY STATES

Ala. *The Effect of Various Vegetative Covers, Rotations, Mulches, and Seedbed Preparation on Runoff Water and Soil Losses From Various Slopes*. To determine effect of (1) 2-yr. rotation of cotton followed by rye grass & reseeding crimson clover the first year & sudan grass for hay or grazing the second year on runoff water & soil & nutrient losses from 5% slopes; (2) 3-year rotation of cotton followed by oats, fescue grass, & ladino clover the first year & fescue grass & ladino clover for grazing the second & third year on runoff water & soil & nutrient losses from 10% slopes; & (3) 2 levels of crop residue from corn and crimson clover returned to soil on runoff water & soil losses.
Agr. Engin. 320. Coop. ARS, SCS

Ala. *Engineering Phases of Supplemental Irrigation*. To (1) determine infiltration rates, retention of moisture available for plant use, & percolation rates of major soil types; (2) establish equipment design factors applicable to supplemental irrigation systems; (3) determine initial cost & operation cost of supplemental irrigation equipment for single multiple use on the farm; & (4) compare various mechanical & vegetative methods of conserving water from natural rainfall & supplemental irrigation.
Agr. Engin. 321. Coop. ARS

Alaska *Irrigation Factors and Costs in Alaska*. (1) Maintain and operate an experimental irrigation system whereby a known amount of water can be applied to plots of timothy, bromegrass, potatoes, & other crops. (2) Learn power cost of pumping & the labor of moving pipe. (3) Calculate economic factors. (4) Explore magnitude of subterranean supply at Matanuska Farm. (5) Study fertilizer-water interaction on crop response.
Agr. Engin. 30. Coop. SCS, USDI-Geo.Svy, USDI-Bur. of Reclamation

Ariz. *Hydrologic Characteristics of a Ground-Water Reservoir - The Avra Valley in Southern Arizona*. (1) Learn coefficient of transmissibility & the specific yield of aquifers in various portions of Avra Valley by means of pump tests. (2) Correlate by use of these values the estimated or computed pumping draft with the amount of depletion learned by water level measurements & reconcile the values for specific yield & coefficients of transmissibility with the figures obtained by volumetric depletion.
Agr. Engin. 1

Ariz. *Cotton Production Under Irrigation*. To (1) improve cotton cultural practices, & (2) determine influence of environmental, physiological & genetic factors on quality & industrial qualities of cotton grown in southern Arizona.
Agron., Range Mgt. 264. Coop.ARS

Ariz. Factors Affecting the Production of Citrus in Arizona. To study (1) rootstock effects & nursery management, (2) adaptation of new varieties & strains, (3) soil management in relation to nutrition, (4) nutritional & growth stimulating sprays, (5) citrus irrigation, & (6) low temperature effects, surveys, grove heating.
Hort. 299. Coop. ARS

Ariz. Sprinkler Irrigation Studies Under Arid Southwestern Conditions. To determine (1) combined losses from evaporation & drift with commercial type sprinkler heads; (2) losses by evaporation from wetted foliage & soil surface; (3) limiting rates of application & relation to fineness of spray on soils with low infiltration rates; (4) adequacy & uniformity of distribution as affected by interception by foliage in irrigation of citrus; & (5) to study other factors in the economics of sprinkler irrigation.
Hort., Agr. Engin. 303

Ariz. Hydrology and Water Utilization of Small Drainage Areas on the Valley Slopes in Southern Arizona. To (1) determine amount of surface runoff available for diversion or storage, relation between runoff & intensity & amount of precipitation, surface evaporation losses from small storage reservoirs, & possibilities of direct groundwater recharge from them; (2) investigate various methods of distilling & clarification of flood waters in connection with infiltration studies; & (3) provide basis for estimating costs for use of flood waters.
Agr. Engin. 375. Coop. ARS

Ariz. Culture and Water Economy of Soil Improving Crops. Develop cultural practices for establishing a vegetative cover on irrigated farm land released from cultivation in southern Arizona. (2) Learn minimum amounts of irrigation water necessary for survival of a desirable plant cover & the efficiency of use of this water in forage production. (3) Learn residual effect of cover crops on soil fertility & physical characteristics.
Agron., Range Mgt., Engin., Chem. 402. Coop. ARS, SCS

Ariz. The Influence of Bed Shape, Planting and Irrigation Practices on the Germination and Yield of Row-Crops on Saline Soil. To study influence of bed shape, bed slope, planting & irrigation practices on germination, stand, & yield of row-crops on saline & saline-alkali soils.
Agr. Chem., Soils 409 Coop. ARS

Ark. Ground Water Resources and Recharge in the Rice Growing Area of Arkansas. To learn (1) by use of a vertical well hydrologic conditions set up in recharge; (2) effect of chemical compatibility & bacteriological contamination; (3) amount of surface filtration & other treatments necessary for successful recharge using surface water; (4) Estimate cost of artificial recharge using results of project as a basis for these determinations; (5) Check depth-to-water in irrigation wells of rice-growing areas to learn water level trends & verify or disprove safe yield calculations previously made.

Agr. Engin. 106. Coop. Fed. Land Bank, USDI-Geo.Svy., Dept. of Army-Corps of Engin.

Ark. Supplemental Irrigation Investigations with Horticultural Crops. To (1) study influence of varied water sources on soil condition & crop response with particular reference to sources with high salt content, & determine if such waters can safely be used under any conditions of horticultural production; (2) measure value of supplemental irrigation in terms of yield & quality of horticultural crops now generally produced in Arkansas; (3) determine if supplemental irrigation can be used in developing production of new horticultural crops in Arkansas; & (4) study possible changes that may be needed in management program of irrigated crops, such as planting dates, varieties, & disease & insect control.

Hort., For. 310

Ark. Supplemental Irrigation Investigations with Agronomic Crops. To (1) evaluate methods of learning critical soil moisture levels for irrigation, (2) learn optimum rate & grade of fertilizer and optimum time & method of application for agronomic crops grown under irrigation on major soil types of state, (3) evaluate yield responses of certain selected agronomic crops when irrigation is by sprinkler & furrow methods, (4) learn effect of plant population, planting dates, & other cultural management practices that may have possibilities of influencing degree of response of agronomic crops to supplemental irrigation, (5) evaluate effect of land leveling operations required for furrow irrigation on soil fertility properties of soil & resultant yield or certain agronomic crops, & (6) study methods of increasing infiltration rate of irrigation water into soil in which rate is slow.

Agron. 311

Ark. Engineering Phases of Irrigation in Arkansas. Learn rates at which water may be applied to various soils on which crops are growing; (2) Evaluate & develop devices used to learn when to irrigate; (3) Determine irrigation efficiency in terms of quantitative measurements of water distribution, losses & application; (4) Evaluate systems of irrigation with respect to labor requirements, topographic conditions, power & equipment requirements, & efficient water use; (5) Learn mechanics involved in controlling air temperatures with sprinkler irrigation systems.

Agr. Engin. 312

Ark. The Economics of Supplemental Irrigation of Dryland Crops in Humid Areas. To (1) determine input-output data for various crops by systems of irrigation, depth & source of water supply, & by various soil series; (2) analyze problems that develop either as a direct or indirect result of adoption of irrigation practices; (3) analyze changes in enterprise combinations and practices that are encouraged by supplemental irrigation of dryland crops; & (4) evaluate use of various irrigation systems by crops & physical conditions for each area of the state.
Agr. Econ. 386

Calif. Effects of Range Management on Infiltration, Runoff and Erosion. (1) Develop improved devices & techniques for hydrologic studies. (2) Learn relation between precipitation intensity, runoff rates, & erosion rates thru range improvement program. (3) Develop formulas for estimating magnitude of flood discharge. Learn (4) effectiveness of new vegetation in erosion control; (5) effects of fire on infiltration rates of soils; (6) hydrologic effects of various grazing practices used in management programs.
Irrig. & Soils 1108-LA-D. Coop. FS

Calif. Economic and Social Aspects of Utilizing Ground Water in California. To (1) understand economic implications of difficulties in using ground water in several ground-water basins; (2) study historical development of difficulties & economic & social causes & effects; (3) study various attempts made to overcome difficulties; (4) understand results for failure or success of attempts; & (5) explore whether & how institutional mechanisms now governing use of ground water could be improved.
For., Irrig., Soils 1406. Coop. SCS

Calif. Inorganic and Organic Impurities of Irrigation Waters Affecting Soil Properties and Plant Growth. To determine effects of dissolved and suspended mineral and organic materials contained in irrigation waters on soils and plants including: 1. effects of kinds and concentrations of salts on soil structure and penetration of irrigation waters into soil; 2. effects on plants of materials dissolved in irrigation water; 3. degree of accumulation of harmful salines in soil; and 4. suitability of sewage effluents and drainage waters as irrigation waters.
Irrig. 1529

Calif. Drainage of Lands Under Irrigated Agriculture. To (1) develop & improve techniques for drainage investigation and evaluation of drainage problems, (2) develop criteria & methods for more rational design of drainage facilities thru studies of hydraulic conductivity of soil for water and thru direct or indirect methods of evaluating such hydraulic conductivity, (3) investigate efficiency & permanence of various types of materials & equipment used in drainage facilities, or in construction thereof, (4) investigate other phases of reclamation as related to establishing drainage criteria & the relationships between irrigation & drainage.
Irrig., Soils 1539. Coop. ARS, USDI -- Bur. of Reclamation

Calif. Dynamics of Water Flow in Saturated Soils, and its Application to the Engineering Design of Drainage Systems. To improve engineering practice in drainage design through understanding of physical principles of flow of H_2O thru saturated soil.
Irrig., Soils 1655 (W-28)

Calif. Factors in Watershed Management that Influence the Disposition of Precipitation and Yield of Water. Study factors influencing precipitation disposition with emphasis on vegetation management as a means of increasing water yields.
Soils, Agr. Engin. 1658 (W-32)

Calif. Procurement and Development of Instrumentation for Studying Stresses in Soils, Compaction and Infiltration. (1) Develop techniques & instrumentation for measuring strains, deformation, & characteristics of compacted areas, at depths below a surface subjected to known forces. (2) Produce pressure pans in various types of soils under various soil conditions & types of imposed loads. (3) Produce & study characteristics of filter pans. (4) Develop techniques & equipment for breaking up established pressure or filter pans & measure their behavior during & following the breaking up process. (5) Develop instrumentation for measuring factors affecting infiltration of water into compacted soils.
Agr. Engin., Soils 1673

Calif. Irrigation Management for Crops on Compact or Slowly Permeable soils. (1) Study soil moisture content & other soil characteristics in relation to susceptibility of soils to compaction with particular emphasis on resultant infiltration rates; (2) causes of slow water penetration not attributable to compaction or Na. (3) Learn possible effects of mineral & organic amendments on soil structure & infiltration. (4) Study root development of crops in impervious soils, & relation of root development & root diseases to supply of available water. (5) Evaluate systems of crop & crop residue management which may lead to a more adequate water supply to subsequent crops. (6) Evaluate from water supply viewpoint, crop responses to tillage methods. (7) Develop for slowly permeable soils criteria for land grading, irrigation water management & drainage so soils may be irrigated without plant injury from standing water. (8) Study accumulation of salts from irrigation water & fertilizer residues in relation to water penetration rates.
Irrig. 1673C

Calif. The Causes of Compacted and Impermeable Soils and Methods for Improving Their Structure, Productive Capacity, and Irrigation Management: Subtitle - Factors Influencing Soil Compressibility. (1) Learn relation between soil compressibility & particle size distribution, clay mineralogy, parent material, organic matter content, exchangeable cations, silica-sesquioxide ratio, etc. (2) Study relation between soil, management history, & development of poor physical conditions. (3) Learn what lab. & field tests are most suitable for evaluation of soil physical condition & develop means for interpreting results of tests. (4) Find means for reducing compressibility under specified conditions: study relation between optimum moisture for compaction, rheological constants, & moisture retention characteristics; study influence of soil amendments on these relations. (5) Study influence of type of clay & type of flocculating & cementing agent on soil physical condition as this is reflected by infiltration, permeability to air & water, soil hardness.
Soils & Pl. Nutr. 1673 F-1

Colo. Improvement, Management, and Classification of Poorly Drained Soils of the San Luis Valley of Colorado. To (1) determine optimum level or levels of water table for efficient irrigation and damage; (2) study efficiency of methods of controlling salinity & base exchange, including irrigation, drainage, soil amendments, & leaching; (3) determine crop management practices contribution to soil improvement & more crop production; (4) study effects of irrigating with drainage water, with & without amendments, on salinity, alkali, soil structure, & plant growth; & (5) improve techniques & standards for classifying poorly drained, saline & alkali soils of San Luis Valley.
Agron. 13

Colo. The Influence of Irrigation Practices on Soil Structure and Plant Growth. To learn effect of methods of (1) application of irrigation water on moisture distribution, surface crusting, & plant emergence & growth; (2) land preparation for irrigation & effect of subsequent tillage operations on soil tilth.
Agron., Agr. Engin., Soils 17

Colo. Sealing of Irrigation Canals by Sedimenting with Colloidal Clays. (1) Develop practical low-cost methods of sealing irrigation canals with colloidal clay sediments carried into place by flowing water. (2) Evaluate sealing methods in terms of cost, adaptability to old & new canals, reliability, limits of practical application, & permanence. (3) Evaluate other benefits of sedimenting with colloidal clay materials including stabilizing effects on sandy canal bed materials.
Civ. Engin. 108. Coop. USDI-Bur. of Reclamation

Colo. Improvement of High Altitude Irrigated Meadows. To determine (1) optimum moisture-plant relations for high yield of good quality hay & pasture at elevations over 7000 feet; (2) best fertilizer types & combinations & most effective rates & methods of application of meadow plant species in these meadow areas; (3) most suitable species, strains & mixtures of plants for hay meadows & irrigated pastures at high altitudes; (4) better methods to establish stands of desirable species in old meadows or on new lands; (5) best time of harvest & best management practices to give high yield & quality of hay & forage on mountain meadows; & (6) nutrient value & productive value of hay & forage produced in these experiments.
Agron. 147. Coop. ARS

Colo. Irrigation Water Application and Drainage of Irrigated Lands in the Upper Colorado River Basin. To (1) study drainage characteristics of irrigated hydrologic unit by investigating general hydrology & drainage properties of its soil mantle to develop methods of diagnosing drainage problems or potential problems; (2) develop methods and equipment to study more efficiently the drainage properties of soil mantle; (3) study relationships of irrigation & water application practices to free ground water as means to reduce & prevent drainage problems; & (4) develop improved methods for selecting best treatment in relation to existing or potential water management-drainage problems.
Engin., Agron. 223. Coop. ARS (W-28)

Colo. Soil Fertility, Salinity, and Moisture in Relation to Crop Production in the Upper Colorado River Basin. To (1) determine methods for improving saline and alkali soils through the use of different systems of water management, amendments, cultural & cropping practices; (2) evaluate the physical, chemical, & mineralogical characteristics of existing & potential saline & alkali soils under different moisture regimes which are of significance to diagnosis for reclamation; (3) study fertility status of soils & determine methods & principle of efficient fertilization under different systems of cropping & water management; (4) evaluate the effects of alfalfa produced under different moisture regimes on the accumulation of organic matter & nitrogen, & on the productivity of the soil; (5) determine the optimum moisture conditions for crop production & the relation of moisture status to salt accumulation & nutrient uptake; & (6) study interrelations between the various fertilization practices, soil moisture, salinity, cultural methods, nutrient uptake, maximum & economic yield of the several crops in a rotation.
Agron., Engin. 224 (W-29) Coop. ARS

Colo. Study of Evaporation from Soil Surfaces in Terms of New Soil and Micro-Meteorological Factors Using a Wind Tunnel. Learn relationship involved in evaporation from soil surfaces in terms of atmospheric factors; surface temperature; boundary roughness, & soil factors, including moisture status, permeability, texture, structure, & cultivation.
Soils, Agr. Engin. 227. (W-32) Coop. ARS

Colo. Economics of Alternative Methods of Water Application in Western Colorado. Evaluate alternative methods of water application in terms of costs (man-hours, machine-hours, water, & capital, in form of land leveling, drainage, etc.) & returns (quality & quantity of product) on varying types of land. Develop general guides as to method of irrigation that would be recommended on a specific type of land.
Agr. Econ. 228 (W-33)

Colo. Economic Effect of Ground-Water Laws and Related Institutions on Ground-Water Use in the Lower Bijou Basin, Morgan County, Colorado. (1) Study judicial interpretations & rules laid down in Supreme Court & District Court decision, with reference to possible economic effects on ground-water development for agriculture in Lower Bijou Basin. (2) Evaluate economic implications of alternative legislative means of controlling use of an inadequate ground-water supply.
Agr. Econ., Civ. Engin. 236 (W-42)

Conn. Effect of Soil Properties on the Yield and Quality of Tobacco Grown Under Irrigation. To learn (1) interrelation of irrigation, soil type, physical soil condition, fertilization, row spacing, kind of tobacco, & nature of tobacco root system on yield & quality of tobacco; (2) effect of deepening effective tobacco root zone (by loosening & fertilizing subsoil) on more efficient use of water applied by irrigation in increasing yield & quality of tobacco.
Soils 724 (NE-22)

Storrs (Conn.) Soil-Plant-Water Relationships of Vegetable Crops. To (1) formulate a practical system of predicting need for irrigation of vegetables, & indicate methods of using limited water efficiently; (2) identify critical growth periods in various vegetables when irrigation or lack of it may be beneficial or detrimental; (3) ascertain influence of specific elements in humid climate on use of water by vegetables; (4) note effect of irrigation on vegetable quality at harvest & during storage; & (5) explain differential response of vegetables to varying levels of irrigation in terms of plant physiological processes & soil physics phenomena.
Soils 224

Storrs (Conn.) The Economics of Supplemental Irrigation on Connecticut Farms. (1) Learn extent of use of supplemental irrigation on farms & cost & returns relationships by users. (2) Evaluate & analyze effect upon net farm income of changes in quantity, quality, & timing of crop responses resulting from supplemental irrigation in varying amounts to forage crops, potatoes, & other vegetable crops.
Agr. Econ., Pl. Sci., Agr. Engin. 247 (NE-33) Coop. ARS

Del. The Economics of Irrigation in Delaware. Examine & evaluate factors influencing patterns & use of irrigation on Delaware farms. (2) Assemble & analyze physical & economic input-output relationships of farm irrigation under varying conditions. (3) Analyze profitability of alternative irrigation methods on entire farm business.
Agr. Econ. 18-AE (NE-33) Coop. ARS

Del. Differential Irrigation, Nitrogen Fertilization and the Top and Root Growth of Several Forage Species. Determine influence of differential irrigation & N fertilization on top & root systems of alfalfa, ladino clover, & birdsfoot trefoil, alone & in association with orchardgrass by placing emphasis on: effect of depth of wetting of profile on distribution of root systems; interactions that may exist between depth of wetting & species in relation to root & shoot development; influence of level of watering, N fertilization, & consumptive use of water by several forage species; seasonal effect of differential watering & N fertilization on carbohydrate reserves in storage organs of each species.
Agron., Agr. Engin., Agr. Chem. 22A Coop. ARS

Del. Irrigation of Vegetable Crops. To (1) learn effect of irrigation on yield & quality of important vegetable crops when water is applied at various levels of soil moisture depletion & different physiological stages of plant growth, (2) investigate interactions between irrigation & other cultural practices, emphasizing nutrient supplying practices, control of plant diseases, & chemical applications for weed control, (3) formulate practical method for irrigation program by using soil moisture measurements, weather records, consumptive use date & rooting depths measurements.
Hort. 52-H (NE-22)

Ga. Rates of Nitrogen Fertilization for Corn with Different Levels of Plant Populations With and Without Irrigation. To learn effect of ample supply of water on the interrelationships between N & plant population on corn grown under different environmental conditions & their effects on yield & nutritive value.
Agron. 45

Ga. Quality and Nutritive Value of Cantaloupes as Affected by Levels of Nitrogen Fertilization and Irrigation. Learn effects of irrigation & level of N fertilization on chemical composition & edible quality of cantaloupes.
Home Econ., Hort. 80 (S-32)

Ga. The Effect of Different Plant Spacings, Mulching with Sawdust, and Irrigation Upon the Yield and Market Quality of Strawberries. To determine (1) most satisfactory spacing of strawberries to produce high yields of good quality fruit; (2) effect of sawdust mulch on yield of strawberries irrigated & non-irrigated; & (3) effect of irrigation on yield & quality of fruit & on livability of strawberry plants.
Hort. 90

Ga. Irrigation Practices for Flue-Cured Tobacco. Learn amount & frequency of application of supplemental irrigation required for optimum yields & for efficient production of flue-cured tobacco under high rates of fertilization. Express findings in terms of soil moisture tension, stages of plant growth, & frequency & depth of irrigation to permit wide application of results.
Agr. Engin., Agron. 205 (S-24)

Ga. Soil Physical and Chemical Studies as Related to Supplemental Irrigation of Field Crops. Obtain data on soils of Coastal Plain area of Georgia useful for determining most efficient & economical supplemental irrigation practices for crops.
Soils, Agr. Engin., Agron. 207 Coop. ARS

Ga. Interrelation Between Irrigation, Fertilizer, and Soil Fumigation with Spring and Summer Horticultural Crops. Learn effect of irrigation & hormone sprays when used singly & in combination in production of fall grown tomatoes & effect of irrigation & soil fumigation when used singly & in combination on yield of tomatoes, sweet potatoes, & strawberries. Measure effect of frequency & amount of irrigation water used & interrelationship of these to rate of fertilization on yields of tomatoes & sweet potatoes.
Hort., Nematol., Pl. Path., Agr. Engin. 219

Ga. The Effect of Different Moisture Levels on Rate of Evapotranspiration from Row Crops in the Piedmont of Georgia. Learn (1) response of cotton to 3 soil moisture regimes under completely adequate & normal fertilization, (2) rate of evapotranspiration from cotton grown with irrigation.
Agr. Engin. 310 (S-24) Coop. ARS

Ga. The Relation of the Physical Conditions of Piedmont Soils to the Results Obtained from Supplemental Irrigation. (1) Learn effects of irrigation & certain cultural practices on: Moisture retention characteristic of soil, moisture intake & transmission characteristic of soil, aeration characteristic of soil, mechanics of soil moisture. (2) Evaluate accuracy & reliability of existing moisture measuring devices.
Agron., Soils 313 Coop. ARS

Idaho The Water Requirements of the Apple Tree. To (1) develop a practical technique for determining the point of critical water deficit in fruit tree tissues; & (2) measure effects of acute water deficits on growth of trees & fruit.
Hort. 209

Idaho The Design and Evaluation of Sprinkler Irrigation Systems Under Idaho Conditions. To (1) evaluate engineering design of existing sprinkler systems, (2) investigate performance of sprinkler systems under field operating conditions, (3) establish sprinkler design criteria applicable to Idaho conditions.
Agr. Engin. 247 Coop. ARS

Idaho Irrigation of Bean Seed Crops. To (1) determine optimum frequency for irrigation of bean seed crops, (2) determine relationships between irrigation treatments, varieties, & plant spacing, (3) determine effect of experiment variables of items 1 & 2 on a bean diseases including Sclerotinia, Pythium, & Fusarium root rot, & b maturity date, & (4) test several types of soil moisture measuring devices for accuracy in determining soil moisture content.
Agr. Engin. 251 Coop. ARS

Idaho The Mechnics of Water Control of Steep Irrigated Lands. To (1) test characteristics & effectiveness of water-control devices; (2) evaluate resistnace to erosion of soils subjected to various cultivation techniques; & (3) develop improved devices & techniques to control erosion, & increase efficiency of water use.
Agr. Engin. 288 (W-28) Coop. ARS, SCS

Idaho The Improvement and Development of Stream Flow Measuring Devices. (1) Test existing stream-flow, stage-measuring devices for accuracy of measurement under various stream-flow conditions. (2) Improve design of existing devices based on results of laboratory & field tests. (3) Design new measuring devices to record maximum stages of stream-flow & record stream-flow hydrographs. (4) Test new & improved designs under field conditions.
Agr. Engin., Civ. Engin. 314 (W-32) Coop. SCS

Ill. Runoff from Small Agricultural Areas in Illinois. To learn (1) peak rates & total amounts of runoff from watersheds of 25 to 1,000 acres, (2) comparison of runoff from watersheds under accepted soil conservation practices with watersheds cultivated without regard to soil conservation practices, (3) maximum rates of runoff in different soil association areas.
Agr. Engin., Soils 10-312 Coop. ARS, SCS, USDI-Geo.Svy.

Ill. Laboratory Studies of Conservation and Drainage Structures. (1) Investigate performance of soil & water conservation structures by hydraulic model studies. (2) Study water flow patterns into subsurface drains. (3) Learn causes of failure of certain conservation structures under flood conditions; study remedial measures for control of same.
Agr. Engin. 10-315 Coop. ARS, SCS

Ill. Soil Moisture as a Factor in the Growth and Yield of Corn. To (1) obtain quantitative information on relation between different levels of soil moisture deficiency & growth & physiologic behavior of corn at different growth stages; (2) determine efficiency of water use by corn at different levels of soil moisture deficiency under fertility conditions & plant populations conducive to high yields; & (3) relate water use by corn to open-pan evaporation & other climatic characteristics.
Agron. 15-373 Coop. ARS

Ill. Description of Moisture Conditions and Water Transport in Soils. (1) Examine & evaluate thermodynamics of soil water by giving attention to equilibrium in situations of nonconstant temperature. (2) Develop consistent theory of soil moisture flow for saturated & unsaturated soils, including vapor transfer. (3) Develop method for measuring permeability of unsaturated soils. (4) Study relationship of permeability of soils to pore space geometry, specific surface, moisture content, & other soil parameters. (5) Develop new or improve old methods of characterizing soil moisture in situ.
Agron., Soils 15-381

Ill. Irrigation of Farm Crops on Upland Soils of Southern Illinois or Irrigation of Pasture and Corn. To study (1) desirability of supplemental water for production of pasture & corn; (2) supplemental feeding of beef animals on pasture.
Dix. Spgs. 40-319

Ill. Effect of Planting Method, Slope, Crop, and Weather Conditions on Soil and Water Losses and Yields. (1) Learn effect of seasonal variations in weather on soil & water losses from land used in production of corn. Study (2) effect of slope on soil & water losses during production; (3) planting methods & their effect on soil & water losses & yields.
Dix. Spgs. 40-332

Ill. Water Yields From the Lake Glendale Watershed. To (1) measure water yields as related to size & intensity of storms; (2) study water yields as related to topography, soil & cover type; & (3) determine total water yield in relation to annual precipitation on a forested watershed.
For. 55-342

Ill. Moisture Utilization by Fruit Crops. To learn effect of (1) supply of available soil moisture upon vegetative & reproductive responses of fruit plants, (2) fruit production practices upon efficiency of utilization of soil moisture supply, (3) environmental factors upon soil moisture supply as related to fruit production.
Hort., Soils 65-311

Ind. The Development of Land Use Equations for the Sloping Soils of Indiana. To (1) derive land use equations applicable to Indiana conditions, & (2) evaluate some of the newer practices such as mulch tillage and deep tillage.
Agron., Agr. Engin. 784 Coop. ARS

Ind. Costs and Returns of Sprinkler Irrigation in Indiana. (1) Learn fixed, variable, & total costs of irrigation per acre inch of water applied, per acre application & per acre irrigated for various crops under farm conditions. (2) Explain variations in fixed, variable, & total costs of irrigation. (3) Learn value of additional output attributable to irrigation. (4) Analyze & compare costs & returns of irrigation as currently practiced & thereby appraise profitability of practice under existing economic, technological, & knowledge conditions; obtain information that will indicate changes in production practices & farm organization that will increase returns from inputs of capital, labor, & management via irrigation.
Agr. Engin., Agr. Econ. 816

Ind. Irrigation of Forage Crops in Indiana. Learn (1) water requirements of various crops of state & their responses as to yield, quality, & degree of disease under different soil moisture conditions, (2) effect of various soil moisture conditions on root growth & nutrient uptake.
Bot., Agron., Agr. Engin. 823

Ind. Analysis of the Dynamics of Moisture Flow in Soils. (1) Study flow systems in which saturated & unsaturated flow occurs simultaneously. (2) Characterize mathematically the infiltration process for soil. (3) Develop improved mathematical equation for characterizing flow of water in unsaturated soils.
Agron. 849

Ind. An Evaluation of the Amount of Available Water in the Irrigable Soils of Indiana. (1) Obtain a measure of available water holding capacity of irrigable soil of Indiana. (2) Evaluate relationship between pore size distribution & yield response to irrigation.
Agron., Agr. Engin. 858

Ind. Dynamics of Water Flow in Tile-Drained Land. (1) Study effect on flow when drain runs only partially full. (2) Learn flow, & associated head loss, thru spaces between tile. (3) Study for a falling water table the effect of capillary fringe on flow.
Agron. 884

Ind. Treatment of Surface Waters for Domestic Use on the Farm. (1) Evaluate effectiveness & operational characteristics of slow sand & diatomite filters in treating pond water; compare relative merits of slow sand filter & diatomite filter; make recommendations to farmers for installation of a complete water treatment system for home & grade A dairy use. Learn (2) rates & total amounts of water used by typical farm family; (3) relation between watershed size, cover, slope, soil type, & precipitation on turbidity in ponds. (4) Evaluate effectiveness of "roughing filters" designed to remove peak turbidities & algae from water pumped from pond; evaluate various methods of water storage construction.
Agr. Engin., Agron. 939

Ind. Farm Ponds in Southern Indiana; Costs, Uses and Results. Learn (1) financial requirements for building & maintaining ponds of various types & sizes under various conditions; (2) extent to which ponds are used for various purposes & their impacts on farm organization, management, & returns under various conditions of topography, soil, location, & type of farming.
Agr. Econ. 966

Iowa Movement of Water and Gases in Soil, and Their Relation to Other Physical Properties. To (1) study water & gas movement in soil in relation to drainage & aeration, (2) predict water-table behavior in soils, (3) obtain mathematical formulas for movement of water into artificially made soil cavities, & show application to the measurement of hydraulic conductivity of soils, (4) study mass type flow & diffusion type flow of gases in soils & apply the solutions to soil aeration & methodology, (5) improve neutron scattering device for measuring soil moisture & incorporate into the device a means of measuring soil density by gamma ray absorption, (6) develop theories for using tagged atoms in studying transfer rates of water, gases, ions, etc., in soil, (7) study use of radioactive water in tracing water from different sources into plants, etc.
Agron., Engin., Phys. 998

Iowa

Field Investigations of Subsurface and Surface Drainage. To (1) determine influence of existing tile drainage systems of several designs on water table levels & on crop yields; (2) determine effect of different design features on effectiveness of tile drainage by making experimental installations in various problem areas; (3) develop techniques for layout & installation of surface drainage systems, & make necessary surface drainage machine; (4) develop techniques & investigate materials which might be used for the stabilization of mole channels; (5) study possibilities of using combinations of tile, mole, & surface method in solving drainage problems; (6) study methods of farming over surface drainage systems; (7) make survey of permeability of various soil types as determined by field methods; (8) study effects of soil management & crop rotations on drainage; (9) determine how much soil temperatures are changed by drainage & determine effects of temperature changes on seed germination of plant growth, (10) present recommended design procedures & techniques in such a way as to facilitate use by field personnel; & (11) determine feasibility of subirrigation with drain tiles & drain tubes.

Agron., Agr. Engin., Climatol. 1003

Iowa

Physical and Economic Analysis of Watersheds as Related to Soil and Water Conservation. To (1) establish benchmarks of physical & economic conditions in a particular watershed to measure physical & economic changes; (2) develop methods to extend findings in test watershed to other watersheds, in the state; (3) measure consequences of various land use practices, structures, etc., as to runoff, erosion, land productivity & soil moisture; (4) develop alternative physical means to achieve watershed objectives & appraise various measures for cost, & benefits to watershed to component beneficiaries & contributors; (5) develop physical & economic criteria for assessing costs among land owners, private interests & public agencies, & to evaluate damages from watershed development; & (6) develop & appraise alternative means to share benefits & costs.

Agron., Econ., Engin. 1266 Coop. ARS, Dept. of Commerce-Weather Bureau, USDI-Geo.Svy.

Iowa Soil and Climate Factors Affecting the Efficient Use of Water by Crops. To (1) determine moisture properties of Iowa soils (moisture holding capacity, wilting point, available soil moisture), (2) determine evapotranspiration of different major crop covers on different soils under different weather conditions (particularly on corn), (3) investigate rate of replenishment of soil & subsoil moisture in relation to climate-crop factors, rainfall, evapotranspiration, runoff, crop cover, & mulch, (4) develop a technique for estimating soil moisture over large areas from meteorological data & from limited soil moisture samples, (5) determine optimum soil moisture range for crop growth at different growth periods, under different air temperature conditions, (6) obtain moisture data at specific locations & times, for use in agronomic interpretations, & (7) determine root distribution & development under different subsoil moisture conditions.

Agron., Soils, Agr. Engin. 1276 Coop. ARS, Dept. of Commerce-Weather Bureau

Iowa Development of Portable Equipment and of Methodology for Predicting Rates of Water Infiltration into Soils. (1) Develop a portable rainfall simulating infiltrometer which could be used throughout the region in making predictions of rates of infiltration of water into soil. (2) Obtain data regarding influence of antecedent moisture, plant cover, soil properties, & rainfall intensity of infiltration rates of water into soils. (3) Learn possible correlations between infoltrometer data & runoff data obtained under natural rainfall on small plots & watersheds in Iowa & elsewhere in the region.

Agron., Agr. Engin. 1356

Kans. Effect of Soil Compaction on Crop Growth. Learn (1) effect of soil compaction on infiltration rate & on aeration; (2) effect of compact soil layers on root development & on crop growth; (3) relationship between physical measurements of soil & yield of crops.

Agron. 501 (NC-17) Coop. ARS

Kans. Effect of Irrigation on Soil Properties. (1) Evaluate effect of irrigation water quality on physical & chemical properties of soil under varying soil & climatic conditions peculiar to Kansas. (2) Learn causes of declining production in irrigated lands & find means of correcting these conditions. (3) Formulate sound principles on which to base irrigation practices & on which land & water may be evaluated to learn its potential for economic crop production.

Agron. 525

La. Irrigation Costs and Returns in Forage Production. To estimate (1) costs under different systems of irrigation, (2) returns from different systems of irrigation.
Agr. Econ., Agron. 884 (S-27) Coop. FES

La. The Application of Soluble Fertilizers in Sprinkler Irrigation Lines, and Head-Loss Curves for Aluminum Irrigation Pipe with Quick-Couplers. To learn (1-4) feasibility of applying soluble fertilizers in irrigation water being distributed in sprinkler systems; (2) extent of loss of fertilizers due to vaporization when applied in sprinkler systems; (3) nature, extent, & results of reactions occurring in different Louisiana waters when mixed with soluble fertilizers of different formulations; (4) formulations of N, P, & K best suited for application in irrigation water. (5) Develop head-loss curves for aluminum irrigation pipe with quick-couplers.
Agr. Engin., Soils 894

La. The Value of Irrigation of Forage Crops for Dairy Animals in Louisiana. Study effects of irrigation on temporary & permanent pasture in terms of: variations in quality & quantity of forage production as measured by animal response; interrelationship among irrigation, crop response, animal response & climate.
Dairy, Agr. Econ. 930

Maine Efficient Utilization of Irrigation Water. Learn total water needs as well as critical moisture period during growing period of crops. Make soil moisture analysis on soils of different texture which can be used in designing & utilizing irrigation installations.
Agron., Agr. Engin. 59 (NE-22)

Maine Economics of Irrigation on Potato Farms in Maine. (1) To examine resource characteristics of farms using various irrigation systems. (2) Learn costs & returns in irrigating potatoes under various physical & economic conditions.
Agr. Econ., Farm Mgt., Agron. 89 (NE-33) Coop. ARS

Mass. Irrigation Studies and Management of Irrigated Soils. To determine (1) method of supplemental irrigation suited to various crops, (2) agronomic practices best suited to crops with supplemental irrigation, (3) effect of irrigation on maintenance of soil structure, tilth, and soil organic matter, as well as temperature, micro organisms, and disease control, and (4) cost of installation and maintenance of supplemental irrigation systems.
Agron. 6

Mass. Effects of Supplemental Irrigation on Various Soils and Crops. To learn (1) rates & frequencies of irrigation as they are related to various soil types & various crops, (2) effective root zones of various field, vegetable, & forage crops; & relate findings to irrigation recommendations, (3) soil compaction as related to irrigation & yields of various crops.
Agron., Agr. Engin. 12 (NE-22)

Mass. Bacteriological Study of Sewage Disposal Plants. To study the efficiency of various types of sewage treatment plants using fecal streptococci as indicator organisms.
Bact. 14

Mass. Profitability of Irrigation on Representative Farms. (1) To appraise the economic efficiency (input-output relationships of particular types of distributive equipment used for irrigating forage & cash crops). (2) Learn probable effects on net farm income of particular representative farms using alternative irrigation methods in production of forage & cash crops.
Agr. Econ., Farm Mgt. 47 (NE-33) Coop. ARS

Mass. Cranberry Bog Moisture Relation Studies. I. Drainage of Cranberry Bogs. 2. Irrigation of Cranberry Bogs. To (1) drain cranberry bogs; (2) explore the field of cranberry bog irrigation; (3) determine optimum needs of cranberry vines at various stages of growth; (4) determine supplementary value of irrigation systems in frost protection, liquid fertilizer distribution, & insect control; (5) determine value of watering immediately after harvesting in assisting the vines to withstand or recover from bruising & partial uprooting caused by picking.
Cranberry 117

Md. Effect of Drainage Upon Crop Yields, Farming Practices and Land Utilization. To (1) ascertain development of drainage, (2) determine influence of drainage on yields, (3) ascertain changes in farm practices due to drainage, (4) determine shifts in land use as result of drainage, & (5) determine combination of conditions necessary for practical & profitable farm drainage.
Agr. Engin., Agr. Econ. A-32-h Coop. SCS

Md. Problems Associated With Farm Irrigation in Maryland. To determine (1) costs of irrigation; (2) legality of use of water for irrigation; (3) purposes for which water is now used; (4) sources, amount, & availability of water for irrigation; & (5) that combination of physical, institutional, and economic conditions needed for successful function of irrigation.
Agr. Econ. A-32-j

Md. Engineering, Soil, and Plant Aspects of Supplemental Irrigation. To determine (1) N retention in soil & its availability to plants as related to various irrigation & fertilizer practices, (2) interrelationships of crop species, rooting habit & certain cultural practices to yield & quality of agronomic crops as influenced by irrigation, (3) effects of irrigation on yield & quality of selected vegetable crops of importance in Maryland & the region, (4) interrelationships of supplemental irrigation, fertilizer, & other cultural practices in their effects on yield, quality & mineral nutrient content of vegetable crops, (5) rate of use of soil moisture by vegetable crops at various stages of growth & under varying climatic conditions, & (6) effects of frequency of irrigation, amount of water, starting time of irrigation & distribution methods with specific reference to first 5 objectives.
Hort., Agron., Engin. BOQR-83 (NE-22)

Mich. Water Requirements of Crops. To determine (1) use of water by crops, as influenced by climate, soils & farming practices; (2) basic relationships between soil moisture & crop production; (3) optimum growth conditions for crops under various irrigation, fertilizer & management practices; & (4) proper irrigation equipment design principles & operational practices as affected by peak moisture use, crop rooting habits, fertilizer practices & other design factors.
Agr. Engin., Hort., Farm Crops, Soil Sci. 805

Mich. Sediment Transport in Runoff Water From Small Agricultural Watersheds. To determine concentration and quantity of soil transported in runoff water from small agricultural watersheds, and attempt to determine source of sediment carried in runoff.
Agr. Engin. 806

Minn. Inventory and Survey Minnesota Waters to Determine Their Quality and Availability for Irrigation Purposes. (1) Survey, analyze & inventory waters of state to learn their suitability & availability for irrigation & other agricultural uses. (2) Study & make recommendations as to what method might best be used to develop dependable supplies of irrigation water from the shallow ground-water sources.
Agr. Engin. 1207

Minn. Drainage of Agricultural Land by Pumping. To (1) develop fundamental design criteria needed by engineers & technicians planning pump drainage systems of different types, (2) learn maximum rates of drainage or pumping load, seasonal fluctuations, & annual amounts as related to size & character of area drained, (3) establish & study basic factors influencing efficiency & cost of operation of pump drainage systems.
Agr. Engin. 1211

Minn. Soil Moisture Investigations Relating to Internal Drainage and Supply of Water for Crop Production. To (1) supply information useful in increasing efficiency of drainage and irrigation practices, & (2) improve & develop new criteria & methods for estimating need for & possible returns from control of excess & deficiency of moisture.

Soils 2519

Miss. An Economic Evaluation of Supplemental Irrigation Under Farm Conditions. To learn (1) probable need for supplemental irrigation for cotton, corn, & soybeans; (2) production responses associated with supplemental irrigation; (3) costs associated with different types of supplemental irrigation systems.

Agr. Econ. HA-17 Coop. ARS

Miss. Field Drainage on Bottom and Hill Land for Timely Operations of Tractor Machinery. To study (1) effect of row drainage on operation of tractor & equipment, (2) effects of seedbed preparation on maintaining row drainage, (3) cost of minimum levelling needed to establish & maintain row drainage, (4) effects of diversion ditches & terraces on drainage & crop production in individual fields, (5) pull type perforated plastic tubing for drainage in seep areas, (6) costs of establishing good drainage, (7) methods of maintaining same.

Agr. Engin. HB-3

Miss. The Effect of Supplemental Irrigation on Crop Production and Soil Properties in Mississippi. To determine (1) value of supplemental irrigation in terms of economic yield and quality of various crops, (2) optimum rates and frequency of irrigation, (3) most satisfactory and economical methods of applying irrigation water including cost of various methods, (4) effect of irrigation on physical and chemical properties of soils, and (5) effect of supplemental irrigation on incidence of weeds, insects, and diseases.

Agr. Engin. HB-4

Miss. Soil and Water Conservation Practices. To learn effect of various tillage & cultural practices on H_2O intake & H_2O storage capacity of soils, soil & H_2O losses. To summarize data from State College, Mississippi runoff & erosion station, study effect of mulch practices on H_2O intake & available H_2O storage capacity.

Agr. Engin. HB-7 Coop. ARS

Miss. Evaporation From Black and White Atmometers as Related to Evapo-Transpiration from Agronomic Crops. Learn (1) relation between rate of evapo-transpiration from cotton & rate of evaporation from atmometers; (2) diurnal & nocturnal evaporation characteristics of atmometers; (3) relation between evaporation from atmometers & solar radiation; (4) relation between rate of evaporation from atmometers & standard U.S. Weather Bureau evaporation pan.
Agr. Engin. HB-11

Miss. The Value of Irrigation in Maintaining Year-Round Pastures of High Quality. To learn value of irrigation in terms of economic yield & quality of forage by: 1. obtaining stands in drought periods; 2. learning optimum rate & frequency of application of irrigation water to maintain production; 3. learning best fertilizer rates & analyses to be used with irrigation; 4. period & amount of production of various forages to maintain continuous production of high quality forage; & 5. effect of irrigation on incidence of diseases, insects, & weeds.
Agron., Crops HC-16

Miss. Effect of Pasture Irrigation on Milk Production Per Acre and Per Cow. To (1) determine effect of irrigation of a temporary summer grazing crop on carrying capacity, milk production per acre & distribution of grazing, & (2) measure any increase in carrying capacity, milk production per acre, or distribution of forage production of annual winter grazing crops resulting from use of irrigation to insure establishment & increased fall growth.
Dairy Husb. HG-5

Miss. Development of Water Resources for Irrigation. Learn (1) potential ground water supply for irrigation for various areas, (2) maximum area that could be safely irrigated for a group of streams without impairing for other uses (3) hydrologic characteristics of watershed to predict more accurately quality of water available for farm ponds that could be used for irrigation.
Agr. Engin., Soils RRFB-2 Coop. USDI-Geo. Svy.

Mo. The Use of Water in the Production of Agricultural Crops. To (1) determine physiological effects of application of water to different species of plants at different stages in their growth; (2) develop reliable criteria for determining when various species will benefit from water; (3) study response of different varieties to particular levels of available soil moisture; (4) determine possibility of lowering rate of transpiration of various crops; (5) determine influence of fertility level on yield & quality of crops grown under various soil moisture levels; (6) determine optimum rate & amount of water application for various soils to be irrigated; (7) determine effect of irrigation on physical & chemical characteristics of various soils; (8) study changes in management practices, such as disease & insect control, made necessary by use of additional water in crop production; (9) determine present sources of water & develop design data for surface reservoirs as source of irrigation water; (10) adapt existing methods & develop better ones for irrigating under humid conditions; (11) integrate use of irrigated pastures into livestock production; & (12) make case studies with farmer cooperators on costs and benefits of irrigation.

Hort., Engin. 1

Mo. The Use of Water in the Production of Agricultural Crops. a. Irrigation and Tillage in Corn Production. To determine (1) optimum irrigation procedures to be used in the production of corn with high fertility levels; and (2) type of seedbed preparation that will give greatest return for corn under irrigation.

Agr. Engin. 2

Mo. Soil and Water Conservation Management. To (1) determine under full soil treatment, best terrace spacing, grade, channel capacity & treatment, & extent to which point rows may be eliminated for major soil series in Mo.; (2) determine effect of terraces on power, labor, & machine costs in crop production & on yields; (3) investigate new designs of water management structures, to improving them & reduce costs; & (4) investigate use of land leveling for improved drainage of flat lands, elimination of field ditches & as a seedbed preparation method for farm crops.

Agr. Engin., Soils 43 Coop. ARS

Mo. The Effect of High Fertility on Runoff and Erosion. a. The Effect of High Fertility on Runoff and Erosion from a Claypan Soil. To determine (1) effect of high fertility on runoff, soil loss, soil moisture and crop yield on claypan soil; (2) effect of crop residue mulch and subtillage on runoff, soil loss and crop yield with continuous corn having high fertility treatments; and (3) relationship between runoff & soil loss from small fractional acre plots & from plots covering full length of slope.

Soils 77 Coop. ARS

Mo. Farm Water Supply. To (1) design & test effectiveness of at least two different experimental vertical slow-sand filters under different pond water conditions; & (2) develop a practical technique for filtering pond water & set forth specifications for such a filtering system, which can consistently be expected to supply water suitable for domestic purposes in farm homes.
Agr. Engin. 155 (NC-9)

Mo. Effect of Forest Cover on Soil and Water Resources. (1) Hydrologic orientation: obtain, analyze, & interpret existing hydro-meteorological records to provide a sound basis for initiating & interpreting later, long-time studies on small drainage areas, (2) Soil Moisture studies: learn effect of timber cutting & surface soil condition on soil moisture, including observations of water table in shallow wells, interception of precipitation by trees & litter, evaporation, & transpiration, all of which are variables in hydrologic equation, (3) Small watershed studies: determine influence of forest land-management practices on quality, quantity, & timing of runoff from paired experimental drainage areas including a regimen of streamflow from undisturbed forest areas during initial standardization period of several years, b effect of abusive watershed practices, c effect of restorative watershed practices.
Soils, For. 158 Coop. ARS, Dept. of Army-Corps of Engin., Dept. of Commerce-Weather Bur.

Mo. The Use of Water in the Production of Field Crops. To learn the effect of irrigation on yield & quality of (1) corn grown under different levels of fertilization, (2) cotton grown under different levels of fertilization, (3) soybeans, (4) pastures for beef cattle, & (5) forage crops.
Soils, Anim. Husb., Engin., Ent, Forage Crops 204 Coop. ARS

Mo. Use of Water in Production of Agricultural Crops. a. Infiltration Rates and Available Water Capacity for Major Soils of Missouri. To assemble equipment and develop methods for determining (1) optimum rate of water application for different soil areas of the state; and (2) available water capacity of principal soil areas of the state.
Soils 211 Coop. ARS, SCS

Mo. Storage and Use of Surface Runoff for Irrigation. To determine (1) amount of runoff to be expected for different drought frequencies for the 3 general soil permeability areas of Missouri; (2) losses by evaporation and seepage from farm reservoirs and methods for reduction of losses; and (3) effect of irrigation on rate and amount of runoff and on soil loss.
Agr. Engin. 227. Coop. ARS

Mo. Returns from the Use of Sheep on Small, Fertile Irrigated Areas. To learn effect of irrigation & irrigation plus fertilizer on growth & nutrient production of Orchard grass, Orchard grass-Ladino clover, & Orchard grass-lespedeza used for sheep production.

Anim. Husb. 235

Mo. Distribution and Application of Irrigation Water. To (1) determine adaptability & efficiency of different methods of applying water to different crops on the principal soil areas, (2) develop design criteria for furrow irrigation, & (3) develop improved equipment & methods for applying irrigation water to tall growing row crops.

Agr. Engin. 265 Coop. ARS

Mo. Water Management in Cotton Production. To study (1) problems relating to obtaining suitable water supply for irrigation, (2) methods & improve techniques for applying irrigation water to cotton, (3) methods & improve techniques of drainage.

Agr. Engin. 271

Mont. Economic Problems of Irrigation Development and Income Potentialities of Farming in Areas to be Irrigated. To (1) determine agricultural potentials under irrigation of areas proposed for development, & (2) analyze problems of developing irrigated farming from dry lands.

Agr. Econ. MS 862 Coop. ARS

Mont. Range Forage Production Changes Through Water Spreading Practices. To determine effect & value of diverting waste water from small drainages onto suitable areas for increasing quality & quantity of forage.

Anim. Indus., Range Mgt. MS 875

Mont. Small Water Project Development as Carried on by the Montana Water Conservation Board. To collect, tabulate, & analyze data on activities of Montana Water Conservation Board as basis for: 1. measuring accomplishments of this method of developing small water projects; 2. considering adequacy of type of State agency; 3. providing information whch may clarify issues for other states & the Federal Government in policies on small water developments; 4. studying relation of state developed water projects to basin development programs; & 5. defining field of "small water project development."

Agr. Econ. MS 879 Coop. ARS

Mont. Soil-Water-Plant Relations of Forage Crops with Different Water Table Levels. To determine (1) influence of different water table levels & other water management procedures on production & quality of hay & pasture on high altitude meadows; & (2) determine best fertilizer practice, soil amendments & cultural practices for maximum economic production of pasture & hay under various water management practices.
Agron., Soils MS 918 (W-29)

Mont. Efficiency of Water Storage and Use for Crop Production in Semi-Arid Areas. To (1) determine soil factors which influence amount and rate of water loss from soils due to evaporation, and seasonal patterns of upward and downward flow of water vapor thru soil mass associated with temperature differences; (2) determine factors influencing rate and amount of water flow over short distances in soil, e.g., to germinating seeds or growing roots; (3) determine to what extent the depth at which moisture is stored in soil incluences efficiency of its use by plants; & (4) devise methods of increasing efficiency of water use for plant growth.
Agron., Soils, Chem., Engin. 145 MS 935

Mont. Institutional Structure in Water Resources Development. To (1) review, describe, and appraise past and current practices of financing, allocating & reimbursing costs of multiple purpose water resources development; & (2) develop & recommend practices of financing, allocating & reimbursing costs of multiple purpose resource developments that meet needs of comprehensive, integrated & coordinated national water resources policy.
Agr. Econ. 124 MS 941

Mont. The Effects of Cost Structure on the Method of Application and the Quantity of Irrigation Water Used by Montana Farmers. Learn effect of level of charges & method of charging for use of irrigation water on (1) optimum (income-maximizing) quantities of water applied, under selected methods of application; (2) method of water application, given optimum quantities of water for each selected method; & (3) differences of optima from existing application methods & levels of water use. Objectives will be sought in areas limited & unlimited in water.
Agr. Econ. 132 MS 960 (W-33)

Mont. The Response of Pasture Grasses and Legumes to Different Water and Nitrogen Levels. Learn adaptation of grasses and legumes to various water and N levels under simulated pasture conditions.
Agron. 153 MS 962 Coop. ARS

Mont. Forecasting Seasonal and Annual Water Supply. (1) Increase accuracy of forecasting seasonal & annual stream flow. (2) Evaluate effect of all hydrological factors on runoff from western watersheds. (3) Further develop analytical procedures & techniques for forecasting floods from snowmelt. (4) Forecast critical low flow of mountain streams used for irrigation as flow recedes from peak to base flow.
Agr. Engin. 26 MS 972 (W-32) Coop. SCS, FS, USDI-Geo.Svy.

Mont. Efficient Application of Irrigation Water. Increase efficiency of irrigation with furrow & flooding methods by reduction of surface runoff & percolation losses. Learn relation between size of stream & length run for different conditions of soil & slope for most efficient application of water. Learn effect of rate of infiltration on size of stream-length-of-run relationship.
Agr. Engin. 27 MS 973 (W-28) Coop. USDI-Bur. of Reclamation

Nebr. Effect of Crop Residues on the Surface and Other Soil Conservation Practices on Soil Erosion, Intake and Retention of Water and the Production of Crops. To study (1) fundamental factors involved in the phenomena of intake & retention of water by soils; (2) comparison of systems of soil culture & management with respect to their effectiveness at erosion control & moisture utilization & the interrelation of these to crop yields.
Agron. 247 Coop. ARS

Nebr. Soil Moisture Relations in Nebraska Soils. To learn (1) relationships of moisture constants for Nebraska soils; (2) effects of exchangeable cations on physical conditions of soils as they affect the water-soil relationships; (3) effects of natural & synthetic organic matter on physical condition of soils as they affect water-soil relationships; (4) types of clay minerals in soils as they affect moisture relations of soil; & (5) permeability of fluids in different soil types.
Agron. 310 Coop. ARS, USDI-Bur. of Reclamation

Nebr. Water, Soil and Plant Relationships in Crop Production on Irrigated Lands in Nebraska. Procedure will consist of: Obtaining topographic, soils & geologic data basic to scientific research on field or plot scale; learning basic water-soil-plant relationships in crop production under Nebraska conditions; & studying relative efficiency of methods of application of irrigation water in order to (1) obtain topographic, soils & geological data basic to the design & operation of experimental plots for studies of soil-water-plant relationships, (2) develop plans & provide cost estimates for grading the land area, providing water conveyance & measuring systems, & providing equipment for measuring water & soil loss for the plots, (3) install or guide installation of equipment & facilities, (4) study methods of application of irrigation water, taking into consideration source, "peak demand," supply, soil type, topography, etc., (5) learn optimum use & efficiency of irrigation water in relation to seasonal requirements, adequate soil management & cultural practices, & (6) develop optimum fertility, rotation, tillage & management practices capable of achieving high levels of crop production & maintaining soil productivity under systems of irrigated agriculture.

Agr. Engin., Agron. 352 Coop. SCS

Nebr. Irrigated Pastures for Dairy Cattle. To (1) develop irrigated pasture plan for dairy cattle, which will be suitable for Eastern Nebraska or similar areas, covering determination of plant species most suitable and management of pasture with respect to rate and time of fertilization and grazing; (2) determine irrigation requirements for high producing pastures and evaluate factors which may influence amount of water required during each irrigation period; (3) determine if addition of abundant pasturage to a good feeding program would affect breeding efficiency, health, milk production, and length of productive life of dairy cattle; (4) observe effect of use of abundant pasturage upon cost of milk production; (5) determine to what extent usual seasonal variations in Vitamin A value of milk can be affected by use of irrigated pastures; (6) determine what return can be expected in this area, from land used for irrigated pasture; and (7) determine relationship between oxidized flavor in milk and amount of pasture used in the ration.

Agr. Engin., Dairy Husb. 378

Nebr. Soil Management Under Dry-Land and Irrigation Systems of Farming in Western and Central Nebraska. To determine (1) best soil management practices to use in irrigation farming to maintain high level of soil fertility & a high level of production; (2) irrigation which will give maximum efficiency of water use & a high level of production; & (3) best soil management practices to use in dry-land farming to use soil & water most effectively for crop production & maintain high soil fertility.
Agron. 418 Coop. ARS

Nebr. Determination of the Effect of Different Combinations of Equipment Components and Different Methods and Sequences of Performing Various Tasks on the Labor Required to Operate a Portable Sprinkler Irrigation System. To learn (1) effect of basic physical variables upon labor required to move portable irrigation pipe, (2) how to plan best sequence of events for performing tasks required to move sprinkler irrigation laterals, service & start irrigation pumping plant, flush laterial lines, & perform system maintenance.
Agr. Engin. 523

Nebr. Methods and Costs of Distributing Irrigation Water on Rolling Land in the Republican Valley. Learn costs & benefits of irrigating land by methods suited to rolling land as: level benches, gradient benches, contour furrows, & sprinkler irrigation.
Agr. Econ. 529 Coop. SCS, FES, USDI-Bur. of Reclamation

Nebr. Tillage Practice in the Central Great Plains in Relation to Erosion and Weed Control, Soil Moisture, and Crop Response to Fertilizers. Learn (1) relative efficiency of stubble mulch vs. clean tilled fallow for control of wind & water erosion; (2) most practical & effective methods of conducting stubble mulch farming; (3) most practical methods of controlling downy bromegrass in wheatfields of western Nebraska; (4) effect of tillage method on soil moisture accumulation; (5) relative effect of fertilizer on yields on stubble mulch & clean tilled fallow under limited rainfall conditions.
Agron. 543 Coop. ARS

Nebr. The Relationship Between Meteorological Factors and the Rate of Water Use by Corn. (1) Relate evapotranspiration, meteorological phenomena, & physical characteristics of the soil to crop response. (2) Develop a water use equation for calculating irrigation needs of corn.
Agr. Engin. 570 (NC-46)

Nebr. Engineering Phases of Land Treatment Related to Soil-Storage and Use-Efficiency of Rainfall. (1) Make a theoretical analysis of relationships between quantity & rate of rainfall & calculated evapotranspiration in relation to moisture accumulation & potential soil moisture levels under different cropping rates & sequences. (2) Analyze engineering phases of land treatment to establish potential ways for improving soil moisture storage & use efficiency of rainfall, (3) Field test phases of land treatment which indicate potential improvement in soil moisture storage & use efficiency of rainfall.
Agr. Engin. 573

Nebr. Cost of Distributing Irrigation Water by the Sprinkler Method. Learn (1) relation between investment, operating costs & labor requirements, & amount of use in distributing irrigation water (hand moved systems) to corn & low growing crops by sprinkler method. Study (2) soil & topographic conditions under which sprinkler irrigation is a more economic method than other methods; (3) composition & efficiency of sprinkler systems now in operation.
Agr. Econ. 575 Coop. ARS

Nev. An Economic Analysis of Irrigation for Meadow Land. (1) Evaluate costs & returns of alternative methods of irrigation for meadow lands. (2) Develop criteria & standards by which farmers can learn economic feasibility of altering their present irrigation on meadow land.
Agr. Econ., Agron, Range Mgt. 7 (W-33) Coop. ARS

Nev. Comparative Irrigation Requirements and Crop Yields, Under High Water Table Conditions, of Pasture Grasses and Legumes With Normally Different Average Rooting Depths. To learn, under high water table conditions, for different pasture grasses & legumes (1) comparative quantitative seasonal irrigation requirements, (2) comparative required irrigation frequencies, (3) comparative yields under irrigation regimes, (4) comparative water use efficiency of plants studied, in terms of dry weight yield vs. weight of water applied.
Farm Dvlpmt. 22 Coop. ARS

Nev. Evaluation of Factors Relative to Drainage of Lands Damaged by High Water Table Conditions. (1) Learn relative importance of causes for high water table problems in a representative 20 square mile study area. (2) Develop methods & equipment for determining relative importance of various causes for high water table problems. (3) Develop economically & physically feasible methods for correction of high water table problems in study area & in other similar areas.
Soils, Agr. Econ., Agron. 26 (W-28) Coop. ARS, USDI-Bur. of Reclamation

Nev. Factors Affecting Establishment of Forage Crops on Irrigated Lands in Nevada. To (1) study effects of season of planting, seedbed preparation, irrigation interval & their interaction on establishment of irrigated forage plants on saline soil that has a high water table, (2) evaluate methods of seeding on forage plant establishment, (3) investigate effects of water table & competition & other factors on establishment of forage plants.
Agron., Range Mgt. 45

Nev. Water Studies in Relation to Forage Crop Production in Southern Nevada. To determine (1) basic consumptive use of more important forage crops grown in Nevada, & (2) irrigation efficiencies practical & feasible under southern Nevada conditions.
Agron. 89 Coop. ARS

N.H. Water and Fertilizer Requirements of Selected Crops and Soils as Related to Supplemental Irrigation. To determine (1) need for irrigation & provide hydrological data by analysis of precipitation data for designing an irrigation system, (2) moisture-release curves for soils representative of New England, (3) effect & interactions of rates of irrigation & rates of fertilization needed for economic production of forage crops & potatoes, & (4) effect of supplemental irrigation on the movement of applied fertilizer in the soil profile.
Agron., Engin. 99 (NE-22) Coop. ARS

N.H. Effect of Tractor Weight on Soil Compaction. Learn effect of tractor weight, speed & drive wheel slippage on soil compaction at different moisture levels on representative New Hampshire soils.
Agr. Engin., Agron. 108

N.J. The Economics of Irrigation on New Jersey Farms. (1) appraise present irrigation system. (2) Study input-output relationships of irrigating different crops under varying physical & economic conditions. (3) Learn economic effect of irrigation on entire farm organization.
Agr. Econ. 44 (NE-33)

N.J. Computation of Evapotranspiration and Analysis of the Water Balance in New Jersey From Climatic Data. (1) Test various methods of computing evapotranspiration from climatic data in state. (2) Learn soil moisture & water balance on a statewide basis from climatic data & compare results with measurements of these quantities at experimental sites. (3) Obtain from analysis of punched-card weather records data on evapotranspiration, soil moisture, & water balance in state for a representative period of past years. (4) Study applicability of above information.
Soils, Met. 378 (NE-35) Coop. ARS, Dept.of Commerce-Weather Bur.

N.J. Rural and Urban Aspects of Water Pollution. Study various types of pollution of surface & underground waters as they affect public health & environmental sanitation.
Sanit. 586

N.J. Soil-Plant-Water Relationships as a Basis for Irrigation. To learn (1) water needs of crops under different environments, (2) response of different crops to supplemental irrigation at certain growth stages & under various soil moisture deficiencies, (3) means of increasing efficiency of water used by plants, (4) method of knowing when to irrigate certain crops, (5) infiltration capacity, texture, structure, permeability, total & available water holding capacity & moisture release characteristics of each of significant layers within or immediately below profile, (6) effect of irrigation on physical properties of soil, (7) crop tolerance to soluble salts & other substances in irrigation water, & long & short term effect on physical, chemical, & biological characteristics of soils.
Soils, Agr. Engin. 646 (NE-22) Coop. ARS

N.Mex. Economics of Pump Irrigation Farming in Lea County. To determine (1) cost of water for irrigation in Lea Co. basin; (2) production needs, cultural practices, & cost of production for various enterprises; & (3) most profitable combination of crop & livestock enterprises by analysis of farm organization data & by preparation budgets.
Agr. Econ. 8

N.Mex. Economics of Pump Irrigation Farming in the Extancia Valley. To determine (1) cost of water for irrigation in Torrance County basin; (2) production requirements, cultural practices, and cost of production for various farm enterprises; and (3) most profitable combination of crop and livestock enterprises by analysis of farm organization data and by preparation of budgets.
Agr. Econ. 31

N.Mex. Water Requirements of Cotton (Extra-Long Staple, and Upland, Acala 1517C) Grown on Light-Textured to Medium-Textured Soils in Mesilla Valley, New Mexico. To determine (1) desirable frequencies of irrigations for cotton production; (2) desirable range of depths of irrigation applications for optimum production with limited, & an adequate water supply; (3) effect of variable depth irrigation applications; (4) utility of electrical resistance blocks as a suitable method for determining "when to irrigate"; & (5) relative use of water by single beds as compared to double beds with furrow irrigation.
Agr. Engin. 41

N.Mex. Forage Production, Management, and Mixture Trials, With Irrigated Pasture Crops. To learn effect of various stimuli on yield & botanical composition of forage on grass-legume mixtures as (1) a. rate & frequency of N applications with constant P, b. frequency & closeness of harvest, c. spacing of mixtures of alfalfa & alta fescue & alfalfa & perennial ryegrass broadcast & in alternate rows, d. spacing of alfalfa overseeded with barley in fall & Sudan grass in summer. (2) To learn with new strains, varieties & species of perennial grasses & legumes, a. performance, in observance nursery, of new strains & introductions, b. yield & composition of mixtures overseeded on Coastal Bermuda grass, c. response of Coastal Bermuda to varying rates of N, d. effect of frequency & closeness of harvest on yield & root growth of Coastal Bermuda. (3) To learn yield & leaf percentage of most commonly grown Sudan grass varieties.
Agron. 49

N.Mex. An Analysis of Ground-Water Laws, and Related Institutions as they Affect the Economy of Lea County, New Mexico. (1) Inventory ground-water laws & administrative judicial decisions applying to Lea County. (2) Evaluate experiences & decisions with ground-water laws as affecting economy of county. (3) Estimate & evaluate probable future economic effects of present ground-water laws & decisions on Lea County.
Agr. Econ. 59 (W-42)

N.Y. (Cornell) An Investigation of Drainage Problems Under New York State Conditions, With Special Emphasis on Design Principles and Practices. To (1) determine the specific drainage design problems as they exist in New York State; (2) investigate these problems with the aim of determining adequate design criteria; & (3) determine influence of various management practices upon design & maintenance requirements for drainage systems.
Agr. Engin., Agron. 38 Coop. ARS

N.Y. (Cornell) Methods to Improve Design and Utilization of Sprinkler Irrigation Systems. Learn (1 & 2) consumptive use of water by various vegetable, field, & pasture crops; simple method for scheduling irrigation; (3) Increase efficiency of sprinkler irrigation system.
Agr. Engin., Veg.Crops, Agron. 39 (NE-22) Coop. ARS

N.Y. (Cornell) The Economics of Irrigation in Western New York. (1) Learn relationship between total acre-inches of water applied & costs of operation for different kinds & sizes of irrigation systems. (2) Economically evaluate yield responses by fruits & vegetables to irrigation under different systems of management. (3) Learn what combination of crops, especially fruits & vegetables, most effectively use irrigation water over a period of years. (4) Establish water needs & capital requirements under average conditions for the more common crops using irrigation.
Agr. Econ. 192 (NE-33) Coop. ARS

N.C. Pasture Irrigation. To (1) study feasibility of irrigating pastures under soil and climatic conditions existing in North Carolina; (2) investigate effect of irrigation upon nutritive value and productive capacity of pastures; (3) study effect of irrigation upon management and fertility requirements of some pasture plants and mixtures of plants; (4) develop methods and determine best systems of irrigating pastures; & (5) determine design requirements for irrigating equipment.

Agron., Anim. Indus. H-10

N.C. The Effects of Cultural and Management Practices on the Properties of Tidewater Soils and Their Effects Upon Crop Yields. To determine (1) effects of cultural & management practices & degree of drainage of excess water on corn yields & physical characteristics of Tidewater soil; (2) what sod crop can be grown under varying degrees of artificial drainage on poorly drained Bladen soil; (3) effects of different sod crops on water permeability of Bladen subsoils; (4) water distribution relationship in poorly drained Bladen soil under different cropping systems, & receiving different degrees of artificial drainage.

Soils 111 Coop. ARS

N.C. The Effects of Cultural Practices and Supplemental Irrigation Upon Soil Properties and Orchard Performance Under Sandhills Conditions. To (1) investigate interactions between soil management practice & N fertilization & water supply as to effect upon vegetative & fruiting characteristics of peach, tree survival, & soil properties; & (2) evaluate supplemental irrigation as it affects tree growth & performance, & N requirements.

Soils 116

N.C. The Interrelationships of Soil Physical Properties and Soil Water Movements. To (1) determine draw-down patterns of water table by use of an electric analogue; (2) attempt to measure hydraulic conductivity of undisturbed soil cores & to relate it to soil properties; & (3) study nature & magnitude of forces holding water films on clays, & to relate these to hydraulic conductivity.

Agron. 119

N.C. Development of Criteria for Adequate Drainage and Their Application to Design Methods. (1) Evaluate relation between geometry of drainage systems, soil characteristics & soil moisture on subsurface drained land. (2) Study effect of water table behavior on plant growth. (3) Develop appropriate methods of measuring variables pertinent to a study of above objectives. (4) Ultimately, devise a rational method of designing drainage systems, considering weather uncertainties, crop needs & hydraulic behavior of soil-water complex.

Agr. Engin., Soils 137 Coop. ARS

N.C. Drainage, Site Preparation, and Site Improvement in Relation to Reforestation of Pocosin Lands. Learn (1) if furrows made by 2-disc Mathis fire plow will provide sufficient drainage on lands to prevent accumulation of surface waters when furrows are spaced to serve as site preparation measures prior to planting; (2) distance from main canals to which furrows provide sufficient drainage to be reflected in acceptable growth of seedlings into merchantable products, & learn cost of furrowing; (3) if location in furrow, on berm, or just outside berm, provides best site for setting out seedling; (4) compare survival & growth performance of several appropriate species; (5) by pot culture & in situ tests learn if additions of minerals, lime, N, & minor elements will increase seedling growth.
For. 138

N.Dak. Economic Problems of Irrigation in North Dakota. (1) Learn probable capital requirements for land development & other costs of getting started with irrigation. (2) Obtain input-output data on irrigation to aid farmers to budget effect of irrigation on their farm situations. (3) Develop irrigation handbook of resource material & budgeting procedure that farmers may use to analyze their farm situations.
Agr. Econ., Agr. Engin. 3-12 Coop. ARS, USDI-Bur. of Reclamation

N.Dak. The Effect of Tractor and Equipment Operation on Traffic Soles in Farm Fields. To learn (1) if traffic soles are in various soils & if they survive winter frost action under normal field conditions, (2) depth of soles & effect on water infiltration rates, (3) best soil moisture state for working soils to avoid soles, (4) effect of cultivation of row crops on soil compaction between rows.
Agr. Engin., Soils 4-5

N.Dak. Farm Drainage. (1) Learn practicability of filling "potholes" & providing field drainage with farm type land leveling equipment. (2) Cooperate with ARS on salinity project as outlined in Line Project S.W.C. C4-1. (3) Learn relative snow accumulation in ditches with various side slopes, surface covers, & directions of flow, & learn what effect these characteristics have on drainage effeciency.
Agr. Engin. 4-6 Coop. ARS

N.Dak. Effect of Quality and Management of Water on Physical and Chemical Properties of Selected Soils Under Irrigation. To (1) determine effect of irrigation water of variable quality on physical and chemical properties of a number of soils; and (2) obtain information that will afford a sound basis for use of available water for sustained irrigation.
Soils 15-4

Ohio Interrelation of Frequency of Irrigation and Rate of Application of Nitrogen Fertilizer on the Yield and Quality of Potatoes Grown on Sandy Loam. To determine (1) at what soil moisture level irrigation should be applied to obtain maximum yield of Irish Cobbler potatoes, how rapidly moisture is extracted, how frequently & in what volume water needs to be applied; (2) how much N is needed in fertilizer for irrigated & unirrigated potatoes; (3) effect of irrigation & N supply on specific gravity & quality of potatoes for potato chips; & (4) compare varieties grown on productive soil under large scale methods of culture & irrigation.

Hort. 100 Coop. ARS

Okla. A Study of the Effect of Irrigation Water on Soil Fertility, Soil Structure, and Crop Performance. To determine (1) fertility level necessary to secure maximum returns from irrigation on some major crops, (2) effect of variable quantities of irrigation of different qualities on chemical & physical properties of the soil & the yield of alfalfa over a period of years, (3) effect of additives, natural rainfall, & irrigation on recovery of a soil damaged by the use of poor quality irrigation water, & (4) effect of atmospheric conditions under irrigation on plant growth & crop yield.

Agron., Soils 886

Okla. An Economic Study of Subsurface Water Resources and Development for Irrigation on Oklahoma Farms. Phase 1. To develop comprehensive inventory of quantity & quality of water resources for irrigation. Phase 2. To measure significance to agriculture of water resource development for irrigation on: Physical organization & operations of the farm businesses; costs, returns, & net income; stabilization of the business, & to learn physical, economic & institutional limitations to water resource use & development for purposes of irrigation.

Agr. Econ. 891

Oreg. Development of a Small-Plot Sprinkler Irrigator. Develop the irrigator to have following characteristics: uniform application of water to a small plot; rate of application slower than lowest expected infiltration rate of heavy soil; small enough plot that it will not be limiting factor for choosing size of plot; an area of coverage rectangular in shape; very limited area of coverage outside of a designated plot; low cost of construction.

Agr. Engin. 57-3 (W-28)

Oreg. Soil Moisture: Its Measurement, Movement and Availability to Plants in Unsaturated Soils. To (1) theoretically & experimentally study range of validity of capillary theory as it applies to water in unsaturated soils; (2) evaluate importance of findings from (1) in terms of availability of soil water to plants & moisture movement in unsaturated soils; (3) study influence of soil-moisture tension on aeration status of a soil; (4) critically examine upper limit of available moisture range used in calculating moisture storage capacity of field soils; & (5) study new methods of measuring soil moisture.
Soils 174 (W-29)

Oreg. Frequency and Amount of Irrigation for Selected Crops. To (1) establish effects of various moisture levels, fertility levels, and other cultural practices alone and combined on production and quality of selected crops; (2) investigate relationships of meterological factors and water use rates of crops grown under various moisture tensions, fertility levels, and cultural practices; and (3) continue study of relationship between meteorological factors and water use ratios in variety of climatic areas.
Soils, Agr. Engin. 179 (W-29)

Oreg. Economic Analysis of Laws and Related Institutions Affecting Ground Water Use in the Milton-Freewater Area of Oregon. (1) Predict economic consequences of various methods of allocating ground water within agriculture for a particular ground water basin; (2) learn economic implications of alternative methods of allocating the scarce water resource among agriculture & other uses for a particular ground water basin; (3) establish economic criteria for making a priority rating of beneficial use.
Agr. Econ. 318 (W-42)

Pa. Supplemental Irrigation for Maximu Production of Agronomic Crops. To learn (1) effect of interaction between crops & soil management on frequency & amounts of supplemental irrigation required for maximum production; (2) effects of supplemental irrigation on yield & quality of agronomic crops; (3) extent need for supplemental irrigation may be obviated by selection of drought tolerant varieties.
Agron., Agr. Engin. 1152D (NE-22) Coop. N.E. Past. Lab.

Pa. Methods and Equipment for Measuring Soil Moisture to Determine the Need for Irrigation. Formulate system for learning when & how much to irrigate, employing consumptive use, weather records & soil moisture measurements with special emphasis on an evaluation & improvement of available instruments for measuring soil moisture.
Agr. Engin. 1152-E (NE-22)

Pa. The Agronomic Aspects of Deep Tillage on Pennsylvania Soils. To Study (1) effect of deep tillage on elimination of "plow pans," (2) & evaluate effects of deep tillage on physical properties of soils with compact subsoils & soils with shale substrate, (3) effect of a deep placement of fertilizers & soil amendments on penetration of plant roots, crop yields, & on physical properties of deep tilled subsoils.
Agron. 1260-A Coop. SCS, U.S. Penitentiary, Lewisburg, Pa.

Pa. Economics of Irrigation of Forage Crops on Pennsylvania Dairy Farms. Learn economic feasibility of irrigating forage crops on dairy farms.
Agr. Econ.& Rural Sociol., Agr. Engin. 1295 (NE-33)

P.R. Irrigation Requirements of Crops in the Lajas Valley. To learn (1) if variation in soil moisture tension within available water range has an influence on crop growth, (2) moisture needs of various plants at various stages of development; (3) consumptive use of water by various crops in Lajas Valley.
Soils 53 (S-24)

P.R. Reclamation of Salty Lands in Puerto Rico. To determine (1) sodium content of salty lands of Puerto Rico; (2) salt tolerance of crops that may be grown in salty lands; & (3) practical means for reclamation of salty lands.
Soils 80

P.R. The Economics of Irrigation in Forage Production and Use for Beef and Dairy Cattle. To (1) determine costs and returns for different irrigation systems; (2) determine capital and labor needs for several irrigation methods; (3) evaluate farmer experiences with irrigation; & (4) investigate potentialities of irrigation as a means of increasing productivity of farm resources.
Agr. Econ. 87 (S-27)

R.I. Economics of Irrigation of Forage on Rhode Island Farms. (1) Examine & evaluate factors influencing patterns & use of irrigation. (2) Learn & analyze effect of varying intensity & timing of irrigation on yields of ladino-grass mixtures & learn physical & economic inputs & outputs of forage irrigation. (3) Evaluate effect of irrigation on forage-crop management & overall profitability of farm businesses.
Agr. Econ., Agron. 107 (NE-33) Coop. ARS

R.I. The Effect of Supplemental Irrigation on the Yield and Quality of Irish Potatoes and Forage Crops. To learn (1-5) level of soil moisture when supplemental irrigation should begin for maximum yields; (2) amount of irrigation water needed to bring soils from initial moisture levels to field capacity; (3) how often to irrigate to keep moisture within selected moisture range; (4) adjustment of fertilizer practice needed when using supplemental irrigation; (5) adjustment of fungicide & insecticide use necessary with supplemental irrigation. (6) Study local rainfall data with reference to needs for irrigation. (7) Compare devices for measuring soil moisture with dry weight lab. method.
Agron., Plant Path., Ent. 208 (NE-22)

S.C. Supplemental Irrigation. To (1) determine most effective & profitable use of supplemental moisture on crops of economic importance in South Carolina; (2) test & improve various methods of developing sources of water for irrigation; & (3) adapt, or determine adaptability of various equipment & materials to irrigation.
Agr. Engin. 17 Coop. ARS

S.C. Relation of the Physical Properties of Soils to Infiltration Rates, Evapo-Transpiration Rates, and Irrigation Requirements. To learn (1) effects of crop rotation & other cultural practices on infiltration rates of soils, (2) influence of physical properties of different soil types on infiltration, (3) relation of clay mineral composition of selected soil types to moisture characteristics & other physical properties, (4) relation of physical properties of selected soil types to evapo-transpiration rates using certain commonly grown plants, (5) influence of physical properties of soil, climate, & cultural practices on irrigation requirements of selected crops.
Soils, Agron. 37 Coop. ARS, Dept. of Commerce-Weather Bur.

S.C. Development of Water Sources for Irrigation. To determine (1) site conditions under which shallow ground water may be developed as source of water for irrigation; (2) relative effectiveness of various methods of extracting ground water from sand & limestone aquifers; (3) practicability of vertical drainage of basins locally known as "Grady ponds," & incidental recharge of aquifers or underground reservoirs, thru irrigation wells and pits; & (4) develop & test equipment for extracting water from various aquifers.
Agr. Engin. 56 (S-24) Coop. ARS

S.C. The Effect of Minor Elements and Irrigation on Peach Trees In the Sandhills of South Carolina. To determine the effect of (1) Fe, Mn, Zn, B, & Mg on the growth & yield of peach trees, & (2) irrigation on the growth & yield of peach trees.

Hort., Engin., Agron. 63

S.C. Maintenance of Drainage Channels. To (1) test, modify or develop light machinery for removing silt & vegetation from open channels; (2) determine effective & economical methods of controlling aquatic plant growth in drainage channels, with major attention to chemicals & equipment for applying chemicals; & (3) determine effectiveness of selected grasses on ditch side slopes in reducing growth of undesirable plants, & in reducing erosion of side slopes.

Agr. Engin., Bot., Chem. 66

S.C. Effect of Chemical Composition of Irrigation Water on Yield and Quality of Truck Crops and Tobacco. To learn (1) chemical composition of various sources of water used for irrigation & its relation to local soil & geological conditions, (2) effects on yield & quality of truck crops of chemical composition of water used by sprinkler method, (3) effects on yield & quality of tobacco of ions present in water used by sprinkler method, (4) effects on soil properties of chemical composition of irrigation water.

Agron., Chem. 84 Coop. SCS, FES, ARS

S.C. Irrigation of Coastal Bermuda Grass. (1) Learn difference in yields between irrigated & unirrigated Coastal Bermuda grass. (2) Study effect of N applications on production & value of Coastal Bermuda grass.

Dairy 106

S.C. Drainage and Fertilizer Requirements of Forage Crops Grown on Coastal Plains Soils. To learn (1) relation of degree of drainage of certain soils to growth of various forage crops, (2) fertilizer requirements of these crops on recently drained Coastal Plains soils.

Agron. 124

S.C. Irrigation of Field Crops Under Different Tillage Methods of Utilizing Plant Residues, and the Effects of These Treatments on Runoff, Erosion, Soil Properties, and Yield. To learn (1) effects of irrigation under various tillage methods of handling plant residues on runoff, erosion, nutrient losses, yields, & soil properties; & (2) effect on placement of N fertilizer under various treatments.

Agr. Engin., Soils 130 Coop. ARS

S.Dak. Sprinkler Irrigation Possibilities in South Dakota. To (1) study various sprinkler systems relative to soils & rainfall, & learn most efficient one; (2) compare costs & advantages between sprinkler & gravity methods; (3) learn time & maximum desirable rate at which supplementary water should be applied; (4) study effect of winds on sprinkler pattern.
Agr. Engin. 192

S.Dak. Farm and Home Water Quality Improvement. To (1) investigate ways to reduce salt content of farm water supplies & adapt them to farm water system, (2) learn ways for home laundering in excessively hard waters which will give suitable whiteness retention & fabric strength retention, (3) learn effects of various types of high salt waters on flavor, texture, & nutritional value of foods, & study remedial measures.
Biochem. 275

S.Dak. Possible Toxic Effect on Plants on Iron Laden Water Which is Transported Through Aluminum Pipe for Sprinkler Irrigation Purposes. Learn if irrigation water containing high quantities of exchangeable iron, when transported by use of aluminum pipe for sprinkler irrigation, is toxic to plants.
Agr. Engin., Agron. 281

Tenn. The Effects of Subsoiling, in Addition to Ordinary Plowing and Disking, on Crop Yields and Moisture and Organic Matter Content of the Soil. To compare effects of following tillage treatments on yields of crops in rotation; (1) ordinary turning, (2) subsoiling & turning, & (3) subsoiling & deep disking; & determining influence of tillage treatments on soil moisture levels & organic matter content.
Agron. 41

Hawaii The Physical Properties of Soils I. The Influence of Clay Minerals, Organic Matter, Particle Size Distribution, and Chemical Environment on the Susceptibility of Soils to Compaction and Slaking by Water. Evaluate influence of (1) clay minerals, organic matter, particle size distribution, & chemical environment on susceptibility of soils to compaction & slaking by water; (2) factors on shearing strength & breaking strength of dried soils.
Agron. & Soils 133 (W-30)

Tex. Supplemental Irrigation in East Texas. To determine (1) efficient methods of pumping, conveying, & applying water for supplemental irrigation in East Texas; (2) water intake rate of irrigated soils in East Texas & develop water application methods to prevent ponding & run-off; (3) optimum soil moisture & fertility levels of various soils for cotton, vegetables, forage crops, sorghum, corn & other crops at various stages of growth; & (4) interaction between soil moisture and fertility levels so fertility amendments & water applications may be more efficiently used by growing crops.
Agr. Engin., Agron., Hort. 842 (S-24)

Tex. Conservation of Water and Soil by Use of Cropping System and Related Tillage Practices. To (1) determine effects of cropping systems & certain related tillage practices alone & combined with contouring, terracing & water spreading on crop yields, storage of available water in soil & amount & stability of crop residues maintained on soil surface; (2) determine effects of crop residues, mulches, chemical additives & tillage practices on moisture relationships, soil structure, & organic matter; & (3) evaluate cropping systems & tillage practices to determine if they are feasible, economical & sound from long-time agronomic view point.
Agron. 900 Coop. ARS

Tex. An Economic Study of Supplemental Irrigated Farming in Texas. To (1) determine production needs of more important crops with supplemental irrigation, particularly in the more humid parts, (2) determine crop & pasture yields under irrigation, (3) determine changes in crop production practices associated with or necessitated by irrigation, (4) prepare economic analysis of water use & related management problems.
Agr. Engin., Agr. Econ. & Sociol. 1000 Coop. ARS

Tex. The Origin, Characterization, and Influence of Dense or Impervious Zones Upon Crop Production. (1) Study nature & composition of dense or impervious zones in irrigated soils of Lower Rio Grande & their influence on crop production. (2) Study influence of management practices as they affect development of compacted or impervious layers in irrigated soils. (3) Develop & improve methods & techniques for characterizing soil structural conditions which influence plant growth. (4) develop soil-crop-water management practices that will alleviate or minimize incidence & influence of such zones.
Agron. 1021 (S-14) Coop. ARS

Tex. The Influence of Mineral Nutrition, Irrigation and Variety on the Nutrient Uptake and Metabolism of Cool and Warm Season Vegetable Crops. Learn (1) effect of various levels of macro & micro nutrients on metabolism of plants with emphasis on uptake & utilization of S & Mg. (2) interaction between irrigation & mineral nutrition on cool & warm season crops, (3) differential variety response to macro & micro elements with & without supplemental irrigation.
Hort., Agron. 1044

Tex. Effect of Irrigation Waters of Varying Quality and Salt Content Upon Chemical and Physical Changes Taking Place in Trans-Pecos Soils. To learn (1) chemical changes taking place in Trans-Pecos soils resulting from long-time application of irrigation waters of various salt content, (2) relative structural stability of these soils to irrigation waters of different quality.
Agron. 1048

Tex. The Effectiveness of Soil Amendments and Modified Planting Practices in Facilitating the Use of Highly Saline Irrigation Waters. To learn (1) effectiveness of various soil amendments on physical & chemical conditions of soils & crop growth under application of highly saline irrigation waters, (2) influence of various planting practices upon seed germination, crop growth, & soil conditions of saline irrigation.
Soils, Agr. Engin. 1049

Utah The Drainage of Irrigated Lands. (1) Develop methods for installing shallow drains (moles) & evaluate effectiveness of moles in solving drainage on heavy soils. Evaluate (2) relation of drainage problems to irrigation practices; (3) in field recent developments in drainage theory. (4) Develop instruments & methods for recording & interpreting drainage problems. (5) Continue to collect & record data regarding new & existing drainage facilities.
Engin. 285

Utah Relation of Soil Moisture Regime and Nutrient Supply on Plant Nutrition and Soil Productivity. To (1) study effect of irrigation regime on soils & crops; (2) determine inter-relationships of method of irrigation, soil moisture condition, & nutrient needs for crops; (3) study water needs of various crops as related to weather conditions; & (4) relate movement of water in soil to forces that retain water & to study ways of modifying these forces.
Agron., Irrig. & Drainage 306 (W-29)

Utah Consumptive Use and Irrigation Water Requirements of Crops and Natural Vegetation in the Virgin River Area of Utah. (1) Learn consumptive use & irrigation water needs of crops under different cropping systems, methods of water application & climatic conditions. (2) Conduct tank, plot & field experiments to learn seasonal consumptive use of natural vegetation & agricultural crops & peak daily use & variations in monthly use during growing season. (3) Develop a rational basis for estimating when various crops begin to consume water in spring & how long this continues in fall. (4) Learn amount of precipitation in area which is effective in satisfying consumptive needs of the vegetation. (5) Obtain additional information on what constitutes reasonable conveyance, administrative, & application losses for Virgin River conditions. (6) Learn extent of area growing water-loving plants, amounts of water areas are consuming & practical ways of salvaging such use.

Irrig., Drainage 392 Coop. ARS

Utah The Economics of Alternative Methods of Water Application. Evaluate how farm profits, water use & drainage are influenced by alternative methods of irrigation water application under different physical & economic conditions. Develop criteria & standards by which farmers may determine most desirable method of applying & controlling irrigation water.

Agr. Econ., Engin. 455 (W-33) Coop. ARS

Utah Disposition of Precipitation in Relation to Irrigation Water Supply Forecasts. Learn importance of factors relating to disposition of precipitation & which influence summer streamflow. Factors as snow accumulation, antecedent precipitation, soil moisture deficiencies, current streamflow, temperature, & altitude zones of watershed are to be studied in relation to summer streamflow. Develop improved ways & means for forecasting summer streamflow & develop improved techniques for forecasting snow-melt floods.

Agr. Engin. 459 (W-32) USDI-Geo.Svy., Dept. of Commerce-Weather Bur.

Utah Water Application and Hydrologic Factors in Relation to Drainage of Arid Region Soils. To (1) improve methods for measuring water-table fluctuations; (2) determine effects of weather elements, irrigation, consumptive use, & drainage on water-table fluctuation; (3) develop improved techniques for interpreting & evaluating water-table fluctuations; (4) determine relation between water-table fluctuations & soil permeability & specific yields; (5) determine relation between water-table fluctuations & drainability of soils; & (6) develop improved methods of evaluating & correcting drainage problems.

Irrig. & Drainage 463 (W-28)

Utah

Economic Effects of Ground-Water Laws and Related Institutions in Cache County, Utah. (1) Inventory & evalute experiences in Utah with ground-water laws & institutions as they might apply to drainage & development of underground water for irrigation in Cache County. Determine & evaluate nature & extent of (2) favorable changes in agricultural production that might result from lowering level of ground-water by wells & using water for irrigation; (3) unfavorable changes in agricultural production & domestic water supplies that might result from lowering level of ground-water.

Agr. Econ. 485 (W-42)

Vt.

Movement and Retention of Water in Various Soil Types as Related to Supplemental Irrigation. To learn ability of representative soil types to absorb & retain water by supplemental sprinkler irrigations in improved pastures & strawberry fields; & to measure crop responses to irrigation in terms of yield, quality, & botanical composition in pastures.

Agron., Hort. 27 (NE-22) Coop. SCS

Va.

Soil and Water Conservation in the Limestone Valleys and Upland, Piedmont and Coastal Plain Regions of Virginia. To determine the effect of (1) slope, type of crop, soil properties, cultural practices, & rainfall characteristics on soil & water losses, & (2) topography, size, & shape of drainage area, soil type, vegetative cover, & tillage on peak rates & total runoff; & their effect upon ground water intake & storage capacity.

Agron., Agr. Engin. 86010 Coop. SCS, ARS

Wash.

Factors Governing Stream-Size and Length-of-Run for Furrow Irrigation. To (1) determine the effect of soil structure - which changes with season, crop and tillage - on resistance to soil erosion in furrow irrigation; (2) develop criteria to define the critical soil conditions in a cropping system on which length of run should be based; and (3) develop criteria for furrow length design.

Agron., Agr. Engin. 1218 (W-28)

Wash.

Fundamental Study of Soil Moisture Dynamics and Statics. To (1) study thermodynamic theory of and techniques for measuring energy status or tension characteristics of moisture in soil; (2) study mechanics of moisture movement and intake in soils under unsaturated conditions; to develop quantitative expressions, analytic or empirical, for such movement and intake, and develop methods for evaluating parameters of flow and intake equations; and (3) develop methods for application of energy relationships and equations of moisture flow and intake to solution of agricultural problems involving soil moisture.

Agron. 1219 (W-29)

Wash. Determination of the Influence of Water Management and Amendments on Crop Growth and the Salinity and Alkali Status of Soils. To (1) evaluate or develop methods for rapid and inexpensive appraisal of needs of saline-alkali soils for amendments, and leaching; (2) determine influence of various systems of water management and use of soil amendments on salinity status of soils; and (3) evaluate efficiency of various methods of application of water and soil amendments in increasing germination and emergence of seedlings in sustaining stands, and in promoting plant growth.
Agron. 1220 (W-29)

Wash. Soil Moisture Measurement by Neutron Scattering. To develop techniques and evaluate methods for measuring the moisture content of the soil using neutron scattering under field and lab conditions.
Agron. 1234 Coop. ARS

Wash. The Economics of Alternative Methods of Water Application. Learn how alternative methods of irrigation application under different physical & economic conditions influence farm profits, water use, & drainage.
Agr. Econ. 1281 (W-33)

W.Va. Factors Involved in the Use of Supplemental Irrigation Under West Virginia Conditions. To (1) learn amount & timing of supplemental irrigation for optimum crop yields & develop criteria to provide a practical farm method of scheduling time & amount of irrigation, (2) learn effect of fertility level on yield, botanical & chemical composition & plant growth characteristics of crops grown with supplemental irrigation, (3) calculate length & frequency of periods of rainfall deficiency at selected locations & establish the needs for water to be supplied by irrigation.
Agr. Engin., Agron. 92 (NE-22)

W.Va. An Economic Evaluation of the Use of Irrigation on West Virginia Farms. (1) Learn extent of use of irrigation on West Virginia farms. (2) Analyze cost of different systems of irrigation used by farmers. (3) Learn factors affecting costs of systems of irrigation. (4) Analyze effect of varying inputs of water on farmers' production of fruits, truck crops, & forage crops. (5) Evaluate effects on farm business of alternative irrigation systems to provide a basis for economic decisions.
Agr. Econ. & Rural Sociol. 101 (NE-33) Coop. ARS

Wis. Soil Water Movement: Principles, Measurement, and Relation to Plant Growth. To (1) measure water movement in both saturated & unsaturated Wisconsin soils; (2) investigate principles of water movement; (3) investigate relation of water movement to other physical properties of the soil & to plant growth; & (4) apply measurements to better use of land & water in agriculture.
Soils 855

Wis. Evapo-Transpiration from Crops Under Supplemental Irrigation: Its Measurement for Control of Irrigation and for Evaluating Water Conserving Practices. To investigate suitability of evapo-transpiration measurements for controlling amount & frequency of supplemental irrigation applications & to measure conservation of water by crop management practices designed to decrease evapo-transpiration.
Soils 855-Sub.

Wis. Production of Vegetable Crops and Small Fruits Under Supplemental Irrigation. To (1) determine response of vegetable crops & small fruits to supplemental water; & (2) devise cultural practices with vegetable crops & small fruits which will give maximum returns in yield & quality under supplemental irrigation.
Hort., Agr. Engin., Soils 913

Wyo. Sprinkler Irrigation Distribution Studies. To (1) make sampling investigations: a. statistical analysis of variation over 5'x5' square in various portions of distribution pattern to determine how accurately a single sample can in middle of square be assumed to represent area mean; b. determine if any significant difference exists for precipitation catch of sampling can of different diameter; and c. same for can buried flush with ground surface vs. can placed upright on surface, as to wind conditions; (2) evaluate loss of spray due to wind; (3) study pattern distortion under high winds; (4) study to develop techniques to evaluate losses due to interception storage and evaporation during sprinkling; & (5) tabulate labor expenditure vs. equipment investment per acre sprinkled.
Agron. 557 (W-28)

Wyo. Irrigation Criteria for Forage Crops. To determine (1) maximum tension to which soil at particular depth may dry without significantly reducing forage yield; (2) at which horizon yield most closely correlates with mean peak tension; and (3) effect of deep phosphate placement on moisture removal from subsurface horizons, and any change in relation of tension to yield for specific horizons.
Agron. 558 (W-29)

Wyo. Economics of Alternative Methods of Water Application in Wyoming. (1) Learn how farm profits, water use, & drainage are influenced by alternative methods of irrigation under different physical & economic conditions by comparing costs of gravity flow versus sprinkler irrigation of tilled crops on types of land where either could be used; by economics of wild flooding versus controlled gravity or sprinkler watering of meadow lands; comparison of costs of irrigation with type of pumping unit & fuel; compare efficiency of units both as regards alternative methods of application & variation within each method. (2) Develop criteria & standards useful for determining most desirable method of applying irrigation water.

Agr. Econ., Agr. Engin. 615 (W-33)

REGIONAL RESEARCH, INCLUDING STATES WITH CONTRIBUTING PROJECTS

NE-22 Soil-Plant-Water Relationship As a Basis for Irrigation. (1) To study water supplies for irrigation, including the development of sources and evaluation of quality. (2) To formulate a practical system for determining when and how much to irrigate, employing consumptive use, weather records and soil moisture measurements. (3) To determine the equipment requirements and performance based on crop needs and soil properties; and supplemental uses of irrigation equipment. (4) To measure crop response to irrigation in terms of yield and quality as influenced by the interaction of irrigation with other cultural practices.

Cooperating stations and agencies: Federal-grant projects - Conn., Del., Maine, Md., Mass., N.H., N.J., N.Y. (Cornell), Pa., R.I., Vt., W.Va.; ARS, SCS, N.E. Past. Lab.

NE-33 Economics of Irrigation on Northeastern Farms. (1) To examine and evaluate factors influencing the patterns and use of irrigation on northeastern farms. (2) To assemble and analyze the physical and economic input-outputs for relationships concerned with farm irrigation. (3) To analyze the profitability of alternative irrigation methods on the entire farm business under varying conditions.

Cooperating stations and agencies: Federal-grant projects - Conn. (Storrs), Del., Maine, Mass., N.J., N.Y. (Cornell), Pa., R.I., W.Va.; ARS

S-24 Development and Utilization of Water Resources for Agriculture. (1) To investigate methods of developing and improving sources of water for agricultural uses. (2) To determine moisture requirements of crops and evaluate crop response under different moisture regimes.

Cooperating stations and agencies: Federal-grant projects - Ga., Miss., P.R., S.C., Tex.; ARS, USDI-Geo. Svy.

W-28 Irrigation Water Application and Drainage. (1) To develop principles, equipment, and techniques for improving application of water. (2) To develop equipment, procedures, and techniques for evaluating drainage problems and improving unsatisfactory drainage conditions.

Cooperating stations and agencies: Federal-grant projects - Calif., Colo., Idaho, Mont., Nev., Oreg., Utah, Wash., Wyo.; ARS, SCS, USDI-Bur. of Reclamation

W-32 Basic Hydrologic Factors in Precipitation Disposal Related to Water Conservation. (1) To study the interrelationship of micro-metereological and soil factors as affecting evaporation from soil surfaces. (2) To develop instrumentation for basic hydrologic measurements related to soil and water conservation. (3) To study the factors influencing disposition of precipitation with regard to surface runoff and the regime of that entering the soil. (4) To study the effects of vegetation management on the amount of moisture storage and utilizable runoff.

Cooperating stations and agencies: Federal-grant projects - Calif., Colo., Idaho, Mont., Utah; SCS, ARS, FS, USDI-Geo. Svy., Dept. of Commerce-Weather Bureau

W-33 The Economics of Alternative Methods of Water Application. (1) An evaluation of how farm profits, water use and drainage are influenced by alternative methods of irrigation water application under different physical and economic conditions. (2) Develop criteria and standards by which farmers and others may determine the most desirable method of applying and controlling irrigation water.

Cooperating stations and agencies: Federal-grant projects - Colo., Mont., Nev., Utah, Wash., Wyo.; ARS

W-42 Economic Analysis of Ground Water Laws in the Western States. (1) To analyze the economic implications of present laws which affect ground-water use. (2) To evaluate experience with laws which directly aim at regulating ground-water use. (3) To study specifically the economic implications of rationing ground-water between uses and users.

Cooperating stations: Federal-grant projects - Colo., N.Mex., Oreg., Utah

*W-51 Drainage Design for Irrigation Agriculture. Develop engineering criteria and methods for the more rational design of drainage facilities.

The following regional projects in related fields may be found in other parts of the "Compilation of Research Summaries" as indicated.

NC-9 Farmhouse Requirements and Their Application in the Improvement of Farm Housing.

See Part 13.

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*W-51 has been approved but not yet activated.

NC-17 The Role of Organic Matter and Related Soil and Crop Management Practices in Improving Soil Structure and Other Factors Affecting Productivity.
See Part 21.

NC-46 Soil Moisture Storage and the Use of Water by Agronomic Crops.
See Part 18.

NE-35 The Application of Climatology to Northeastern Agriculture.
See Part 15.

S-14 The Influence of Chemical, Physical, and Mineralogical Properties of Soils on Their Structure and on Plant Growth.
See Part 21.

S-27 An Economic Evaluation of Forage Production and Use on Beef and Dairy Farms.
See Part 2.

S-32 Quality and Nutritive Value of Vegetables as Influenced by Cultural Conditions and Postharvest Practices.
See Part 13.

W-29 Soil-Water-Plant Relationships Under Irrigation.
See Part 21.

W-30 Measurement, Evaluation, and Modification of Soil Structure.
See Part 21.

LIST OF COMPILATIONS OF FEDERAL-GRANT RESEARCH PROJECTS AT STATE AGRICULTURAL EXPERIMENT STATIONS

ARS-23-8: Part Numbers	Subject-Matter Area	Title of Section
1	Agricultural Chemistry	Agricultural Chemistry
2	Agricultural Economics	a. Prices, Incomes, & General Studies of Commodities & Industries b. Farm Management c. Land Economics d. Farm Finance & Taxation
3	Agricultural Engineering	a. Land & Water Use & Development b. Power Machinery & Equipment c. Farm Structures & Materials
4	Animal Husbandry	a. Beef Cattle b. Sheep & Goats c. Swine
5	Dairy Husbandry	Dairy Cattle
6	Dairy Technology	Dairy Technology
7	Entomology & Economic Zoology	a. Field Crop Insects b. Fruit, Nut & Vegetable Insects c. Miscellaneous Insects & Economic Zoology d. Insecticides
8	Field Crops	a. Cereal Crops b. Oil, Fiber, Tobacco & Sugar Crops
9	Food Science & Technology	a. Food Chemistry, Microbiology, Sanitation & Public Health b. Food Engineering, Processing, Product and Process Development, Utilization and Waste Disposal c. Food Quality & Standards, Acceptance, Preference, & Marketing
10	Forage Crops, Pastures & Ranges	Forage Crops, Pastures & Ranges
11	Forestry	Forestry

ARS-23-8: Part Numbers	Subject-Matter Area	Title of Section
12	Fruits & Nuts	Fruits & Nuts
13	Home Economics	a. Human Nutrition
		b. Housing
		c. Clothing & Textiles
		d. Foods-Consumer Quality & Utilization
		e. Household Economics & Management
14	Economics of Marketing	a. Field Crops
		b. Fruits & Vegetables
		c. Livestock, Meats & Wool
		d. Dairy Products
		e. Poultry & Poultry Products
		f. Forest Products & Ornamental & Drug Plants
		g. Cross-Commodity & Functional Studies
15	Meteorology	Meteorology
16	Ornamental & Drug Plants	Ornamental & Drug Plants
17	Plant Pathology & Bacteriology	a. Plant Pathology, Botany, & Diseases of Miscellaneous Crops
		b. Diseases of Field Crops
		c. Diseases of Fruit Crops
		d. Diseases of Vegetable Crops
18	Plant Physiology & Nutrition	Plant Physiology & Nutrition
19	Poultry Industry	Poultry Industry
20	Rural Sociology	Rural Life Studies
21	Soils	a. Soil Chemistry & Microbiology
		b. Soil Fertility, Management & Soil-Plant Relationships
		c. Soil Physical Properties, Conservation & Classification
22	Vegetables	a. Vegetable Crops
		b. Potatoes
23	Veterinary Science	Veterinary Science
24	Weeds	Weed Control